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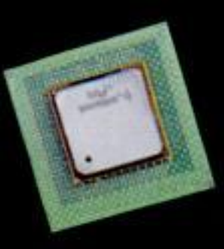

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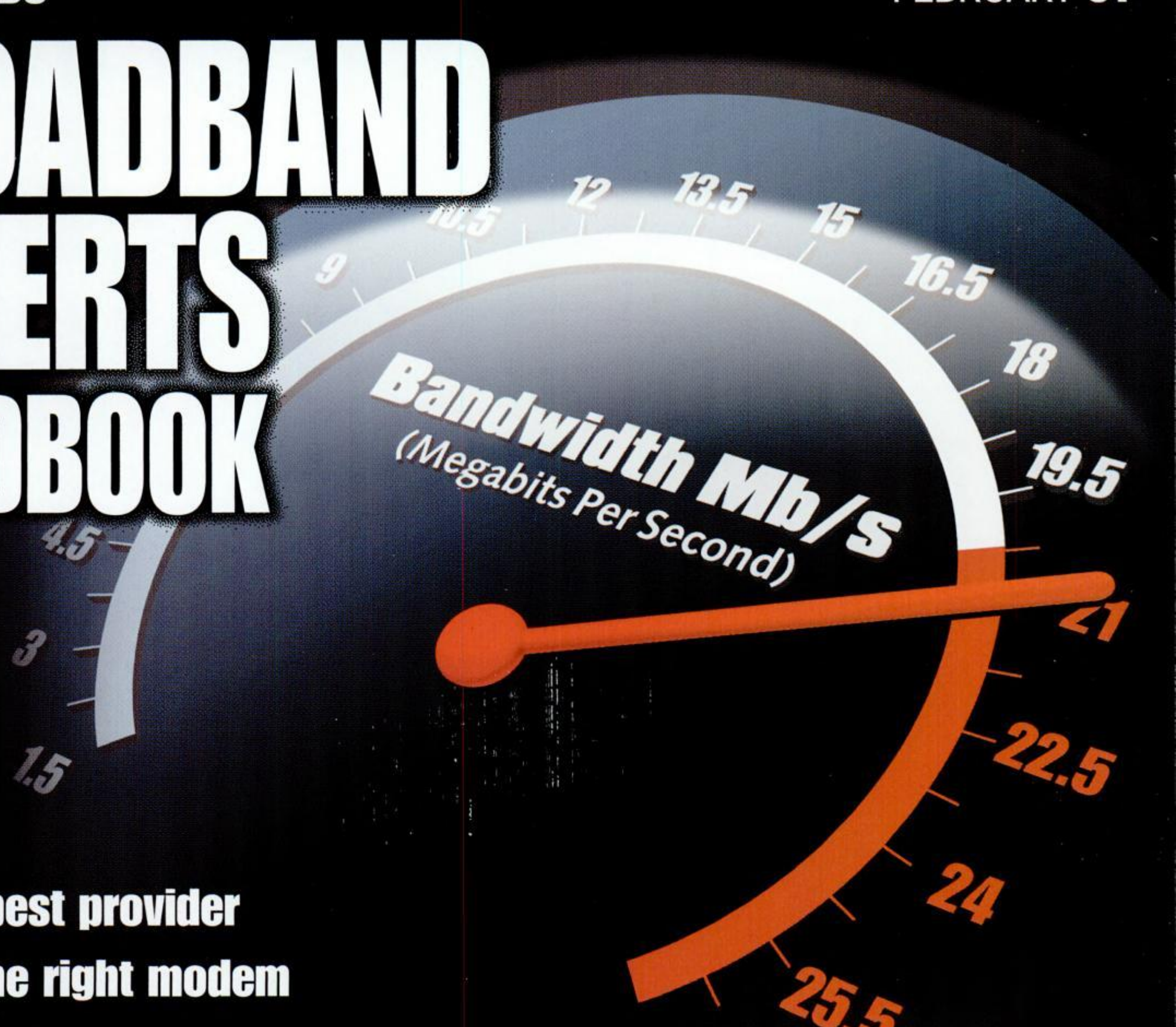

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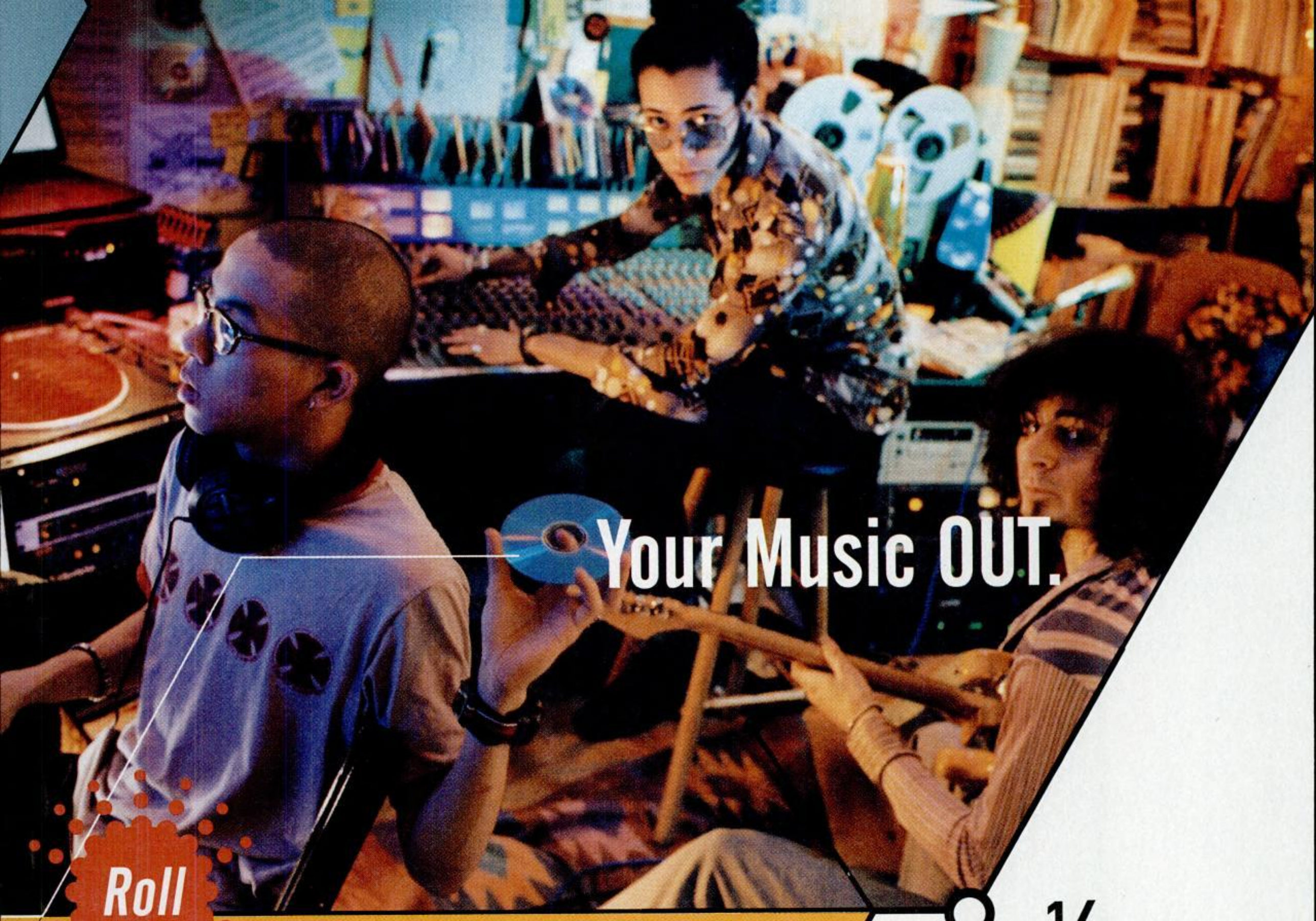

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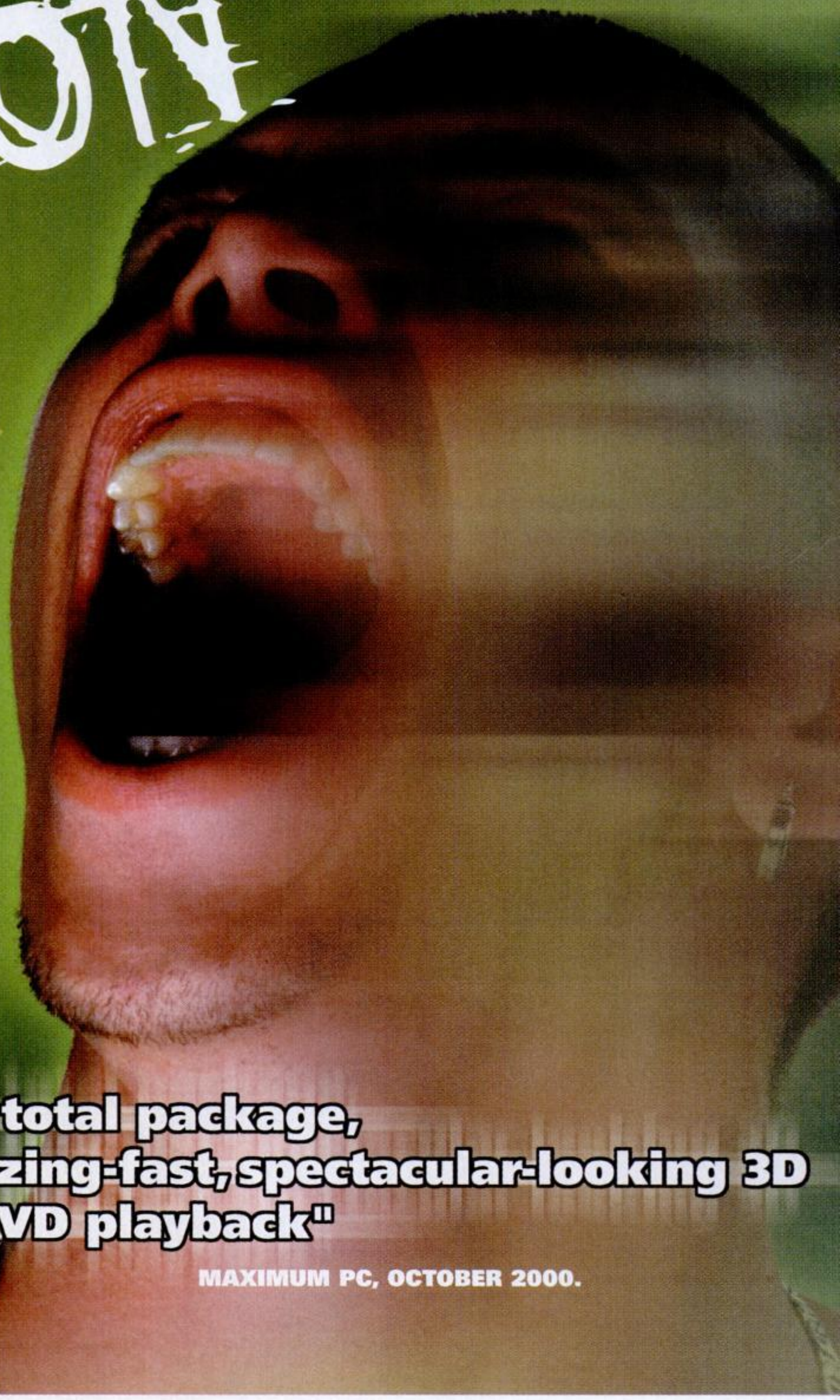

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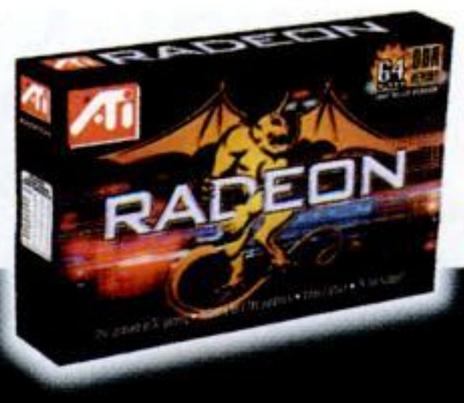

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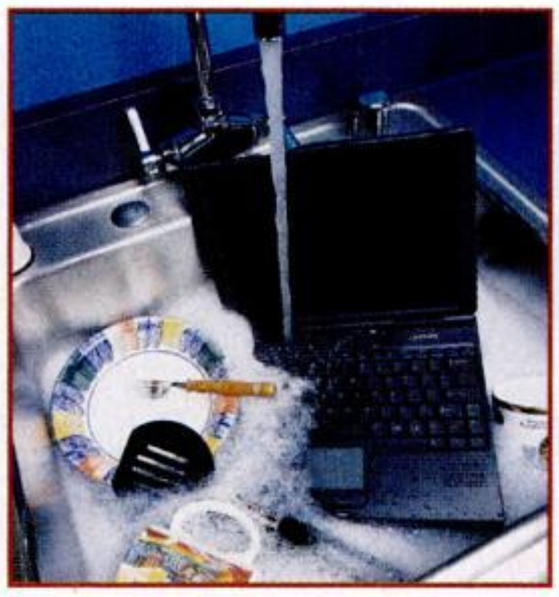

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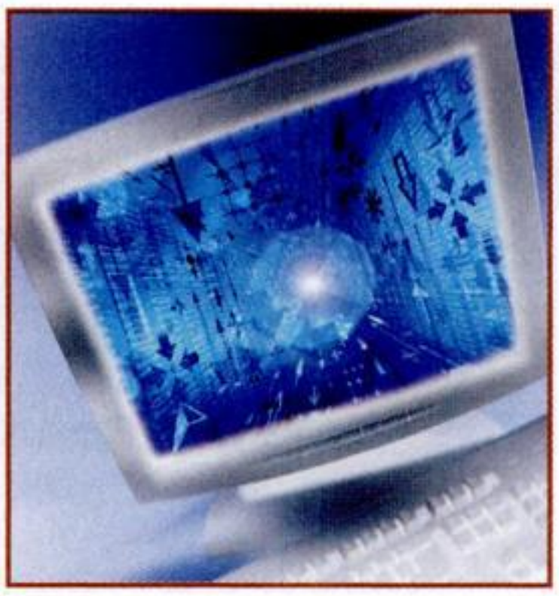

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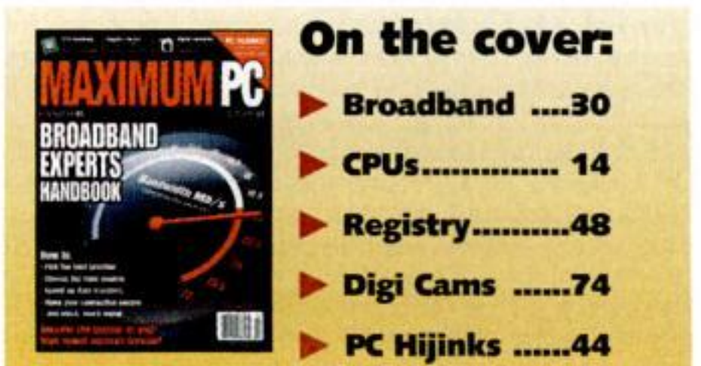

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EDWORD

Behold: Our New NDA Policy

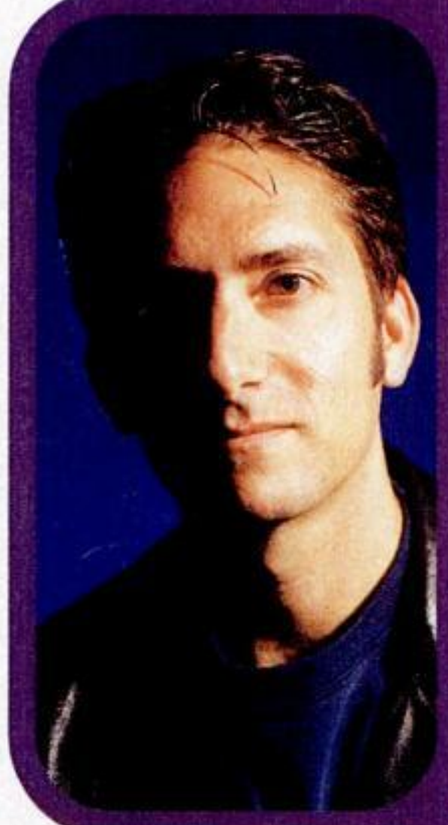
If there's anything our readers hate more than Microsoft OS code and self-righteous Mac owners, it's technology companies that ask journalists to sign nondisclosure agreements (a.k.a. NDAs) in exchange for product briefings. In last month's column, I described the pitfalls associated with signing NDAs and asked readers to contribute opinions on whether *Maximum PC* should play the vendors' game. The volume of your responses was amazing. You can read specific letters in the CommPort section on page 8, but in this space I'll simply paraphrase the overwhelming reader sentiment: It's better to print information that has been gathered with no strings attached than information gathered with vendor stipulations, even if this means giving up an edge to competing magazines and web sites. NDAs compromise the journalist's autonomy, and this ultimately betrays reader confidence. So the agreements should be avoided at all costs.

Before I wrote last month's column, I already had an idea for a new NDA policy. Your opinions only reaffirmed my belief that the new policy would be a step in the right direction. So, beginning on February 1, 2001, *Maximum PC* will begin declining all NDAs. When asked to sign one, we'll do our best to persuade vendors that NDAs defy the basic tenets of journalism and ask them to reconsider. With stubborn vendors, we'll do our best to seek a middle ground. We'll ask them to separate embargoed information from nonembargoed information and invite them to stop the meeting when the "more precious" information is about to be revealed.

In this age of great mistrust of media, it's important to expose the more controversial methods of information gathering.

In cases where vendors refuse to budge and we feel their information is either insignificant or can be attained via other means, we'll simply call an end to the meeting and continue on our way. Thanks for coming. We hope your trip to Brisbane has been a pleasure.

In extreme cases where we feel that signing an NDA is absolutely essential to our competitiveness as a news organization, we will indeed capitulate. But in any articles resulting from an embargoed product briefing, we'll print a disclaimer stating that the information was gathered with NDA strings attached. In this age of great mistrust of media, we feel it's important to expose the more controversial methods of information gathering to public scrutiny.



Perhaps most importantly, we will only agree to NDAs that stipulate specific embargo dates. If *Maximum PC* and a vendor agree that benchmark results can be published on, say, June 23, we will publish the information on June 23, even if the product launch slips and the vendor asks for an extension. Our first commitment is to the reader—and you deserve interesting information at the earliest possible time.

The overarching goal of our new policy is to instill greater reader confidence, reclaim our autonomy and wean vendors from the practice of using NDAs as spin-control tools (they have enough marketing people on their payrolls to control spin as it is). We're quite willing to poke, push, and prod "alternative sources" for NDAed information, and we don't think the new policy will affect our timeliness and accuracy in any tangible way. Please let us know if you think otherwise. If any manifestations of the new policy were to arise, they would appear in the April 2001 issue.

***

In other news: If you turn to the last page of the magazine, you'll see that the Glitch satire column has been replaced with a look ahead to the next issue's content. The column is on hiatus for two months and will return in April with a very special Glitch for the ages.

—Jon Phillips

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LETTERS TO THE EDITOR

Tell Us How You REALLY Feel

We received a surge of e-mail in response to Jon's editorial on NDAs in the January issue. In the main, the letters were passionate but reasonable and very well-crafted—a nice break from the fractured "U guyz suck" manifestos that we receive from lads who probably still have posters taped to their walls.

Your collective message? Reject the NDAs! Nonetheless, a few dissenters did chime in as well. So, following grand *Maximum PC* tradition, we've decided to focus on dissenting opinions in CommPort. As is the case with most letters to the editor, some were edited for length.

In Defense of NDAs

I think you'd be biting the hand that feeds you by not accepting NDAs. They are a part of the tech life, and not accepting them might damage your current relationships with vendors. I agree that there are other ways to gather info, but having the cooperation of a manufacturer is beneficial. Maybe starting to deny them in certain situations is the answer, but inevitably you'll find companies that won't deal with you. The situation sucks, regardless. It's like taxes: I don't want to pay them and try to pay as little as possible, but they're still there.

—Patrick Boehler

Jon Phillips' call to end NDAs is, at best, misguided. Most MPC readers are enthusiasts who find intrinsic enjoyment in the latest hardware. Hardware manufacturers, however, are in this business for the sole reason of gaining market share and earning profits. Premature announcements of product specs give competitors the opportunity to derail a new product launch. The NDA is a vehicle to allow technical journalists to begin working with new products without jeopardizing the livelihoods of the thousands who strive to bring them into existence. Based on Phillips' article, [it seems] the NDA only restricts the timing of a report, not the content. I don't see how this is "spin doctoring," as Phillips states, since the content of the review remains in the jurisdiction of the journalist. Nor do I see the "ethical dilemma" caused by waiting a few weeks before assigning a "9" to both P4 systems reviewed.

—Jonathan Laurer

"Hardware manufacturers, however, are in this business for the sole reason of gaining market share and earning profits."

I think your rant about NDAs is ass-backwards. As an industry editor with 15 years experience, and as a PR flack for five years, NDAs are designed to save your backside. Vendors and PR firms hate NDAs. They are used to provide an even playing field for journalists like you who are on a long-lead magazine.

Suppose Microsoft were to release the news of a new OS to all publications simultaneously. First, the newspapers and web sites would release it, and a week later the weeklies would release it. Two months later, *Maximum PC*'s readers would finally get to see it. NDAs are designed to keep long lead mags like yours in business! Otherwise, you would get scooped on all the big stories.

—Mark Shapiro

Editor-in-chief Jon Phillips replies: Patrick, please read about our new NDA policy on page 7; I believe it will allow us to retain good relations with vendors while still serving the readers' best interests.

Jonathan, vendors are obviously in business for "for the sole reason of gaining market share and earning profits"—that's why exerting as much control as possible over a product launch is vital to their best interests! But, as journalists, our first responsibility is to our readers, not to a particular vendor's shareholders. The vendors rely on us to publish independently conducted benchmark results, but they want us to publish them according to *their* schedules. Well, listen, we're not in the business of helping vendors make money. We're in the business of helping consumers make wise product decisions, and this means spreading the news about a product as quickly and as accurately as possible.

Journalism is about more than just "content." It's also about timeliness. If a looming technology sucks, readers want to know as soon as possible. No one wants to wait patiently for a product to hit the market only to find it was never worth the wait. And withholding information does present an ethical dilemma—just as withholding medical attention from a dying man presents an ethical dilemma (though, certainly, spreading the news on a sucky videocard is much less dire).

Mark, I have to disagree. In the past, vendors have asked that we stick to NDAs even after all the embargoed information has been reported by competitors, whether they also signed NDAs or not. And in the case of the Pentium 4 coverage, Intel asked all journalists to delay the publication of embargoed information another month so that the news reports would coincide with the product launch. I have never, ever heard of a vendor justifying NDAs as a "favor" to journalists. Never. With all due respect, I feel that is an extremely naive position. Vendors have never admitted to spin doctoring, but they have made it clear that NDAs are a protection for retail partners who need to sell older products that are stuck in retail channels.

Editorial Policy: Maximum PC invites letters to the editor; just send 'em to **commport@maximumpc.com**. Please include your full name, home town, and telephone number. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

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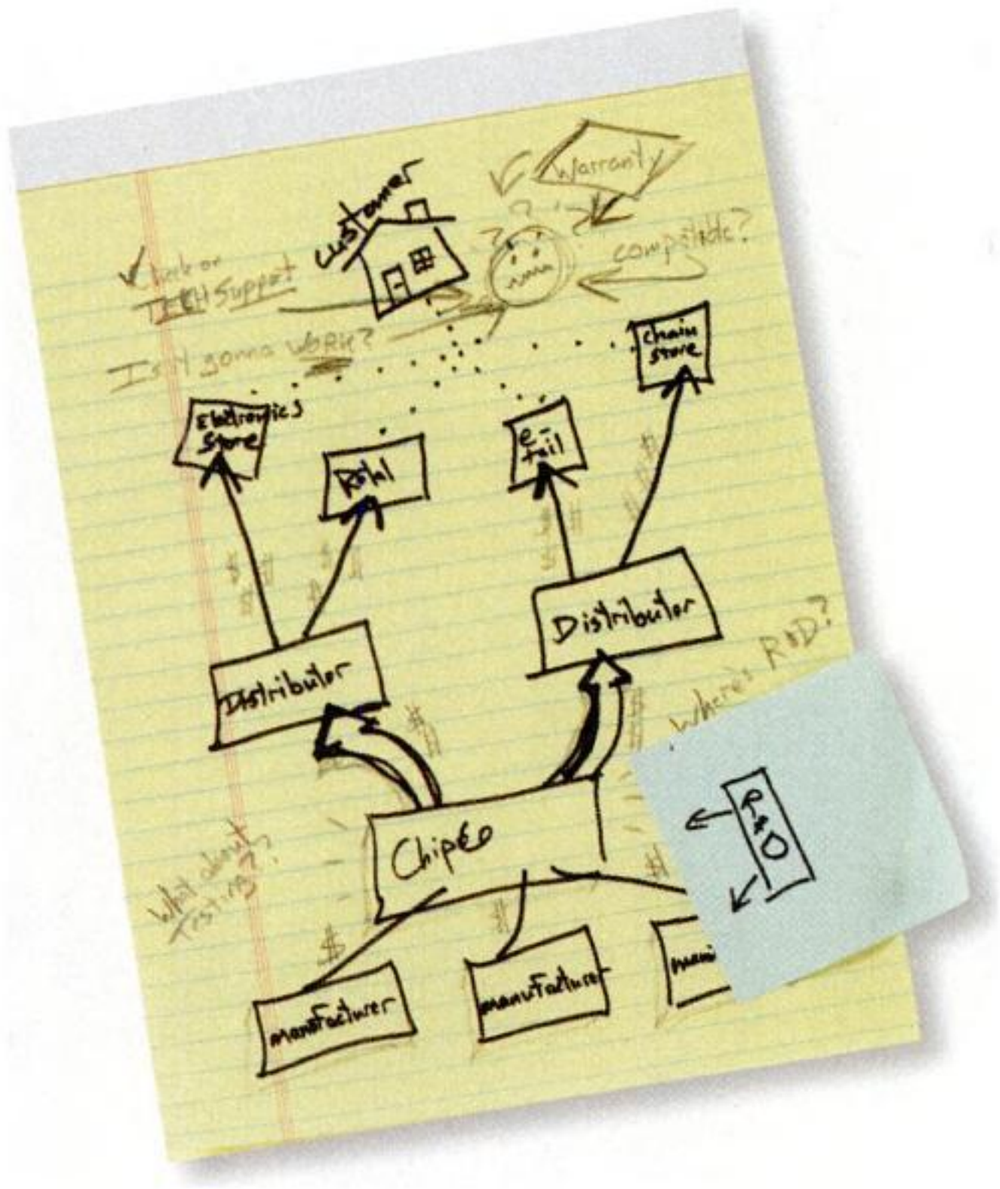
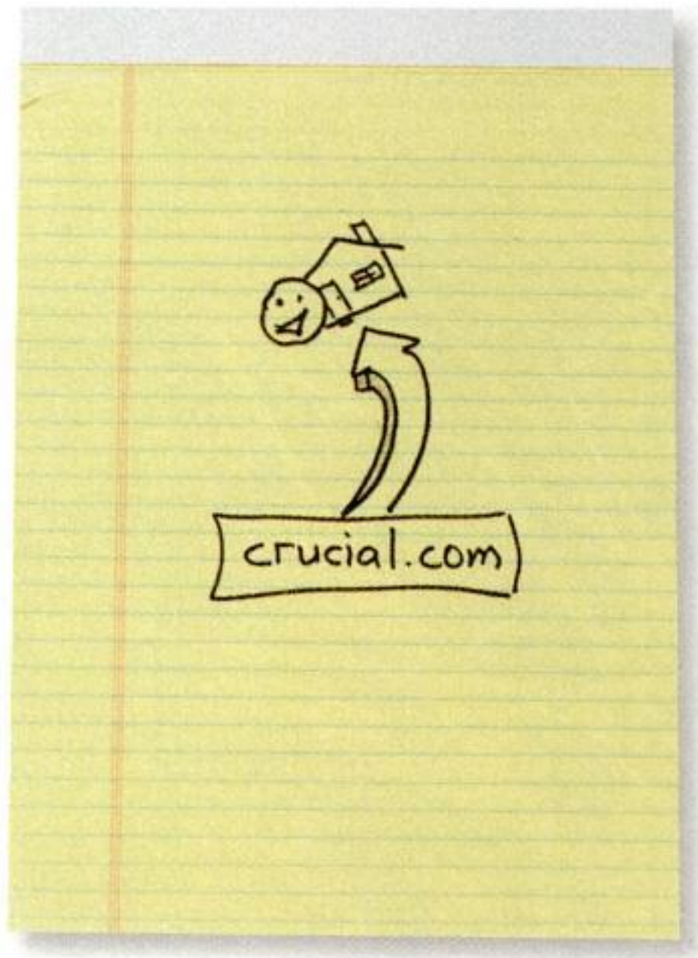


Upgrading your memory doesn't have to be complicated.



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Say No to NDAs

As an engineer for an OEM that manufactures a product in a highly competitive market, I understand full well the use of NDAs. We have outside vendors sign our forms when we have to show them our product. These vendors are highly competitive. They have been known to disclose information to favored clients to drum up more business, which is the main reason NDAs were created in the first place.

In *Maximum PC*'s case, I do not see the good in signing NDAs since you do not "sell" a product; you merely report your findings. The NDAs, in my opinion, are a violation of your First Amendment constitutional right. I would consult a lawyer to see if your field of work can be legally bounded by NDAs. If these vendors are so anal about releasing information and do not want you (or others) to report on their products before a certain date, then they should not ship their products until dates of release satiate all parties involved. In different industries, different rules apply. I do not think NDAs legally apply to *Maximum PC*'s field of work.

—Joe Simonetti

G4 Cube Abuse Continues...

How about a how-to article on fitting the new G4 onto the new VW Beetle as a mongo exhaust pipe, creating the perception of a performance increase in both products? Most people who own one of those products already own the other; you could illustrate how people can sport two overpriced and worthless products at the same time. You could even repaint the bastard hybrid in a boring color called "Synergy Grey" and sell it over the Internet in limited numbers.

—Adrian Rendon

Hack the Apple Display!

I have a comment about your December 2000 review of the Apple Cinema Display. Your only negative comment (not including the complaint about the proprietary interface) concerned the slow 3D game play, but that is the job of the videocard, not the monitor. A kick-ass 3D card would produce outstanding quality on the flat screen. The G4 system reviewed in the same issue mentioned that Apple was going to be shipping the ATI Radeon card [replacing the ATI Rage 128]. Would this solve the problem? Also, I find it hard to believe that the same group of people who built Dream Machine 2000 can't figure out how to hack the Cinema Display to run on a PC. I know your group can figure it out.

—David Thomas

Editor-in-chief Jon Phillips replies: The problem with running 3D games on all LCD displays is that such monitors only have one "natural" resolution, and when you set your monitor to run at different, lower resolutions, the picture becomes a blurry mess due to interpolation. Because the Cinema Display has such a high natural resolution (1600x1024), even the very best videocards available today would have trouble achieving fast frame rates on the panel. As for a hack challenge, dig the following:

"I find it hard to believe that the same group of people who built Dream Machine 2000 can't figure out how to hack the Cinema Display."

Reader David Murrin chimes in with a Tip

Having used an Apple Cinema Display for almost a year and counting, I enjoyed reading your review of this mammoth monitor. I play both sides of the fence—PC at home and an Apple at work—so trying to meld these two machines together is a passion of mine. I recently came across an article detailing the efforts of a user melding a kick-ass Apple display with a PC (**www.coffeehaus.cx/dell_pc+apple_cinema.html**). Enjoy!

P4s Are Full of Holes

I don't know if you guys noticed this (there was no mention of it in your January cover story) but there's a hole in the Pentium 4 processor. What gives? Is Intel trying to remove some of the heat? Is it really a hole, and, if so, what is its purpose?

—Andy Buford

Senior Editor Gordon Mah Ung responds: Intel intentionally put a dimple on top of the P4 die to help its cooling scheme. Intel says some thermal paste may expand as it hardens, and the dimple can absorb some of the extra thermal goop and prevent air pockets from building up between the heat sink and CPU. Grinding your own expansion hole in the CPU die is not recommended and will likely void your warranty as well as kill your processor.

Why Not Plextor?

I'm surprised to see your choice of CD-RW Drive of the Year [December 00] was the TDK VeloCD 12/10/32. *Maximum PC* previously praised the Plextor PlexWriter and even liked it so much to put it in Dream Machine 2000. So it seems unfit to place the TDK VeloCD above the PlexWriter for the Gear of the Year feature. I was so impressed by the specs and your praise of the PlexWriter, I bought one for myself. And [like the TDK] it also comes with the Burn Proof software. Why the sudden change of heart?

—Troy Trahan

Reviews Editor Josh Norem replies: Here's how it breaks down. The TDK and the Plextor drives are essentially the same drive. In fact, some of my sources say they are the exact same hardware, though neither company will confirm this. We fully tested both drives before the December issue went to press, and they benchmarked almost exactly the same, although the TDK drive spanked the Plextor in on-the-fly, mixed-mode copying. Otherwise, their benchmarks were mirror images of each other, down to the second (a nice testimony to the accuracy of our benchmarks). So, since the drives use the exact same hardware, we move to the software realm to break the tie. Plextor ships *Easy CD Creator 4* and the *PlexManager* software. TDK ships *Nero 5*, *TDK Digital Mixmaster*, and *MusicMatch Jukebox*.

We think the TDK software bundle is better. First, during testing I was able to successfully copy a lot more games with *Nero* than I was with the Plextor software. Second, the Plextor drive doesn't ship with MP3 encoding software, but the TDK does (*MusicMatch*). Third, for media players, *TDK Digital Mixmaster* is head and shoulders above *Plextor MVP*. *Mixmaster* comes

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with a 20-band equalizer (Plextor offers no such equalizer), and it lets you drag directories into the playlist (with *MVP*, you have to drag individual MP3s into the playlist). Also, *MVP* made itself the default MP3/WAV player regardless of which settings we chose. That sucks. Although the Plextor software is useful indeed, the TDK package offers more features, better performance, and is an all-around more inspiring bundle. The Plextor drive is great (I have one at home), but the TDK package is just a little bit better.

CD-R Media—Not So Fast

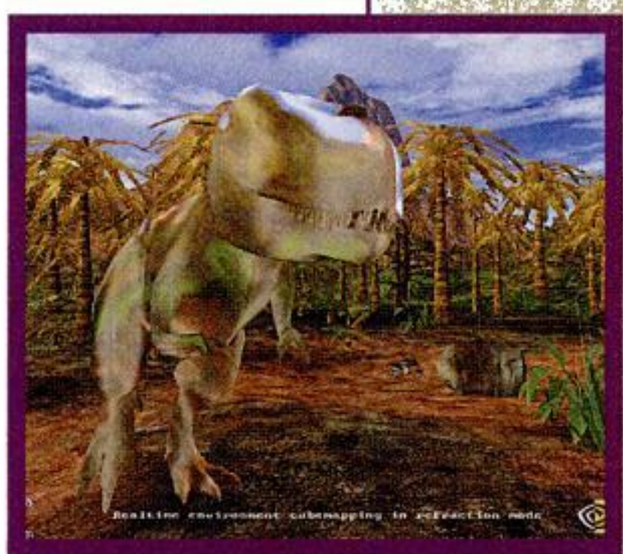
One thing can be said about CD dye colors ["Burn, Baby, Burn," January 01]: There isn't conclusive proof regarding which dye color is "best" for CD-Rs. But I believe Josh Norem is off the mark by stating, "Stick with the known brand names and you won't get burned." I have heard numerous complaints from friends who used name-brand CD-R media (e.g., TDK) for their audio CD needs and were not happy with the results.

The biggest complaint was always, "I hear crackles and pops when listening to CD-Rs on my car stereo." After switching CD-R brands, however, they had no more problems. So the lesson to be learned is, "Use the media that works for you." I haven't had any problems with Mitsui Silvers. (Mitsui Toatsu developed the phthalocyanine dye). They're a bit more expensive than some of the other CD-R media out there, but at least I know the discs will work fine in my car. For an excellent FAQ on everything CD-R, including a lengthy lesson on media, go to **www.fadden.com/cdrfaq/**. And don't forget that CD-RW media is a completely different monster and has a different composition than CD-R media.

—Jason Zietz

Reviews Editor Josh Norem responds: We agree with your statement that the best CD-R media is simply the media that works best for you. Just as you're fond of Mitsui media, the *Maximum PC* staff happens to prefer TDK, Sony, and Ricoh media. With so many different CD recorders on the market, as well as a plethora of CD-ROM players, it's impossible to state unequivocally that a certain brand of media will work flawlessly for everybody. The point we were trying to make in recommending name-brand media is that it's typically more reliable than "no-name" junk media that may have been manufactured using cheap materials, worn-out stamps, and a combination of other performance-inhibiting factors.

We've been told that some no-name media vendors often purchase used CD stamps from big-name vendors, then proceed to use them even after the stamps are well past their prime. Would you want your media made by a stamp that's already pressed 500,000 discs? Obviously not, so that's why we recommend name-brands. Among those brands, it's important to experiment to see which brand works best for your needs.



"What I don't understand is why we can get over 30fps in games, while animation software such as *Bryce 3D* takes several minutes to render one frame?"

Can Game Engines Be Used for Bryce?

Just got my latest issue of *Maximum PC*, and I now have a better understanding of game engines ["Gentlemen, Start Your Engines," January 01]. What I don't understand is why we can get over 30fps in games, while animation software such as *Bryce 3D* takes several minutes to render one frame? My three-minute animation took four days to render. Can't game engines be used for such purposes?

—Dirk

Technical Editor Will Smith responds: There's a fundamental difference between *Bryce* and most game engines. *Bryce* uses a technique called ray-tracing to calculate real-world lighting values for every single vertex (or junction) of every polygon in your scene. Current 3D hardware is incapable of performing those intensive calculations in realtime games. Instead, most use some variation of lightmaps, which are basically special textures that are stretched over the vertices. While lightmaps don't reflect real-world lighting conditions, they are close enough for a fragfest.

There's one other reason why *Bryce* takes so long to render frames: Some *Bryce* models have upward of 10 million polygons, which would choke the most powerful 3D cards available. That's why *Bryce* doesn't require 3D accelerator cards. All of the rendering is done on the PC's CPU.

Whiners Are Full of Gas

I was surprised at the amount of whiners griping about the Pioneer gas plasma display that you included for your Ultimate Entertainment Center PC [November 00] While I agree that it is out of the price range of most sane people, I applaud your effort to push the edge.

That stated, recent developments in LCD projector technology have been quite outstanding. A variety of companies are now selling models that have a native 1024x768 resolution and 2,000 lumens. While this can't quite compete with the resolution of the Pioneer, it can still provide a sensational computing and DVD experience.

—Bill Holland

Tech Editor Will Smith responds: We looked at LCD projectors wired for computers before we started working on the feature, Bill, but quickly nixed them for one reason. Bulb life for most current projectors is insufficient. Most bulbs are rated for under 1,000 hours, and cost several hundred dollars to replace. Bulbs in projectors designed for home theaters last a little longer, but most of them don't include inputs for computers.

CUT, COPY, PASTE

In the December 00 issue, we failed to print the URL of the "Hardware Assassin." You can find more of his mischief at **www.shybe.com**. In the January 01 issue, we printed the incorrect URL for Voodoo Computers. Its correct URL is **http:// voodoo.ca**. The company can also be reached at 888.708.6636 for sales and service.

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The Road to 3GHz

If you thought last year's CPU race was wild, you ain't seen nothing yet. The processor war has heated up to DEFCON 5, and Intel and AMD are preparing to unleash ungodly amounts of megahertz on the world. This roadmap includes

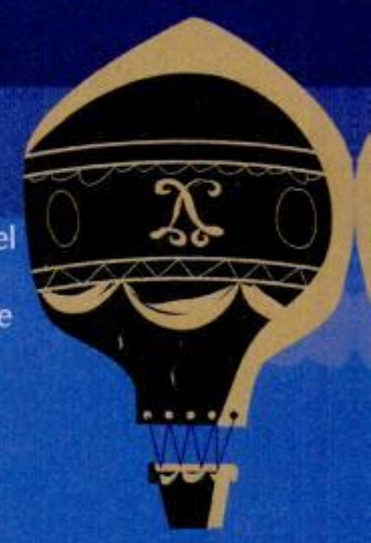
Intel Desktop

Q1 2001

Backtracking on frequency speeds, Intel is expected to introduce a 1.3GHz P4 to fill a marketing gap. Also, Celeron will bump up to 800MHz and finally board the 100MHz bus.

Q2 2001

Back-alley banter has it that Intel will have a 2GHz P4 before Q3 2001. Thank competition for the accelerated timeline. The P-III, meanwhile, will be born again at 1.2GHz on Intel's new 0.13-micron copper process. Codenamed Tualatin, the chip will ride a 200MHz bus and support DDR.



Intel Workstation/ Server

The oft-hyped and long-awaited 64-bit Itanium CPU should finally appear at 733MHz or faster.

Say hello to 1.7GHz Foster—a.k.a. P4 Xeon—along with a new 603-pin socket and the 860 chipset, which grants SMP support. Meanwhile, the old P-III Xeon warhorse should hit 700MHz and pack 2MB of on-die cache.

AMD Desktop

AMD hasn't released details, but a new Athlon using an improved core (codenamed Palomino) is expected to reach 1.33GHz and still be compatible with existing mobo infrastructures.

Add another 200MHz and you get a 1.5GHz Athlon using the Palomino core—AMD showed off such a treat in Nov. 2000. Morgan, a budget version of the Palomino core, will replace the aging core currently used in the Duron. Expect AMD budget chips to clock in at 850+MHz.

AMD Workstation/ Server

AMD expects to have its first dual-CPU Athlon rigs available. Using the 760MP chipset with DDR support, the dual Athies will run on a 266MHz bus with point-to-point connections as well as independent "snoop busses" that promise speeds so fast, your nose will bleed.

SPIN CYCLE

This month's top stories broken down ►

HEADLINE	NEWS	DETAILS	THE SPIN	OUR TAKE
Glitch Prompts Crusoe Recall	NEC recalled a few hundred notebooks sold in Japan after a bug was discovered in a number of Transmeta Crusoe CPUs.	NEC says the glitch could prevent users from reloading their OSes. The hyped Crusoe chip uses code-morphing and consumes very little power.	"The Crusoe microprocessors that NEC is replacing came from a limited manufacturing batch," the company says.	A bug so early in the launch of a new chip doesn't bode well for a company that has to take on Intel and AMD.
Voodoo Doesn't Work with P4	Voodoo3 and 5 AGP cards are incompatible with new Pentium 4 motherboards.	Intel's D850G Pentium 4 motherboards and chipsets are compatible only with 1.5-volt AGP cards. 3Dfx's V3 and V5 cards support 3.3-volt connectors.	"3Dfx does not advise the purchase of either Voodoo3 or Voodoo5 products for Pentium 4 systems," 3Dfx states.	If 3Dfx does eventually fall off the map, this P4 compatibility debacle might be remembered as the beginning of the end.

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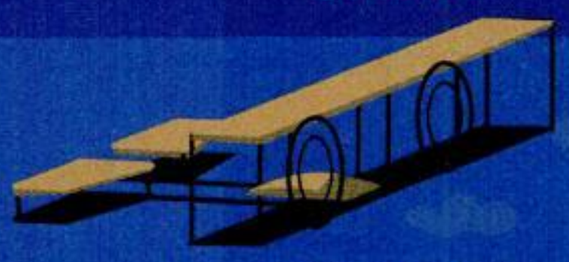
information garnered from the two processor behemoths as well as third-party sources. We threw caution to the wind when making frequency predictions, so don't freak out if parts of this roadmap don't reach fruition according to schedule.

The major drama in 2001 will center around Intel's memory commitments. Will Chipzilla stay true to RDRAM or slyly segue to DDR across every performance category? Memory plans notwithstanding, 2001 beckons the long-awaited introductions of Intel's 64-bit Itanium CPU and AMD's dual-Athlon chipsets. Buckle up, because the convoy is in motion. –Gordon Mah Ung

Q3 2001

Expect North Wood, a 0.13-micron, 2.2GHz version of the P4, as well as a new version of the 850 chipset. North Wood may introduce a new socket that makes the original P4 socket obsolete. Also on tap is the new Brookdale chipset with possible DDR support.

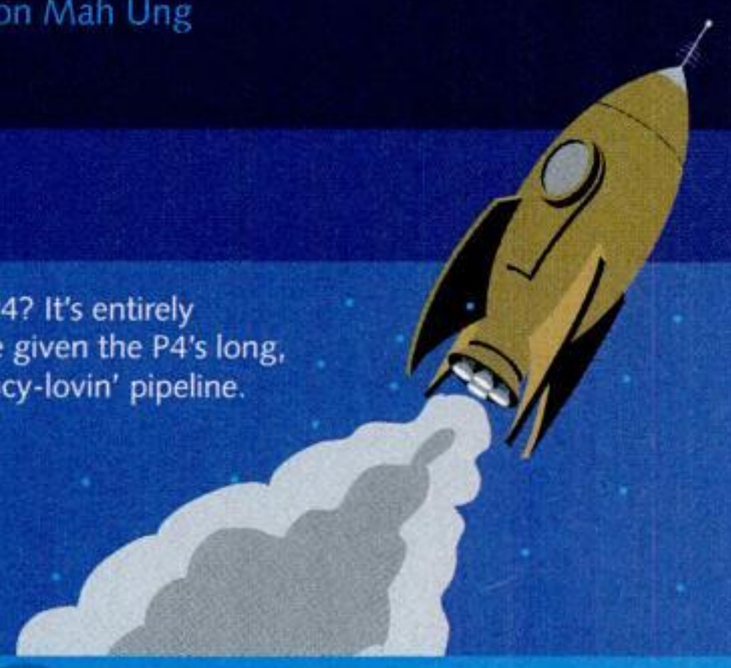
Q4 2001



The Intel roadmap gets blurry this far out, but we predict the P4 will reach 2.5GHz—a nice clean number for the end of the year.

H1 2002

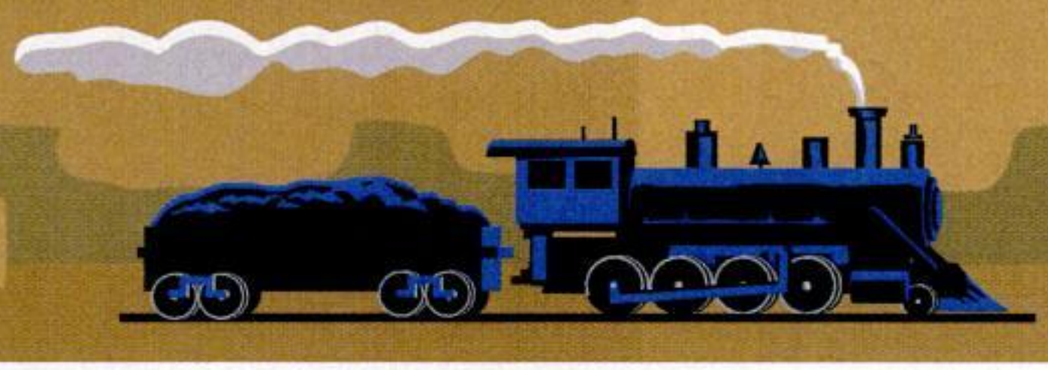
3GHz P4? It's entirely possible given the P4's long, frequency-lovin' pipeline.



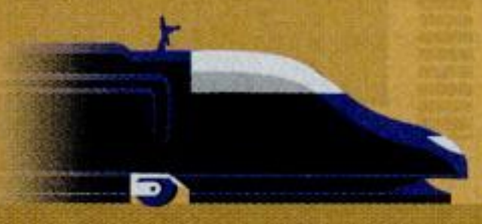
Intel knows that Merced, the first version of Itanium, is just a proof-of-concept. By the end of the year, Intel should introduce the McKinley version with an improved 64-bit architecture and higher speeds for significant performance increases.

AMD predicts—and will probably produce—1.7GHz Palomino Athlons in volume. Where will the frequency headroom end!?!

Expect another new core called Thoroughbred running at 2GHz and offering 64-bit extensions. AMD also expects to have a 0.13-micron copper process online and will produce budget Duron chips at 1.1GHz and faster on a new Appaloosa core.



AMD's own interpretation of 64-bit computing will take form in Sledge Hammer (for 4- and 8-way servers) and Claw Hammer (for workstations). Unlike Intel's 64-bit effort, the new AMD procs will be backward-compatible with old software.



to the pertinent details.

HEADLINE	NEWS	DETAILS	THE SPIN	OUR TAKE
Pocket PC Makes Headway	Having always played second fiddle to Palm, PDAs using Microsoft's PocketPC OS are finally picking up momentum.	New research shows the PocketPC iteration of Windows CE has gained market share, going from 10 percent to 18 percent, according to International Data Corp.	Analysts predict PocketPC will continue to eat into the PDA market and actually hit 40 percent within three years.	Palm's inability to ship PDAs with large amounts of memory and fat CPUs could finally give the Empire a chance at a takeover.
Intel Develops Transistor as Small as DNA	Intel says it has developed the ability to create transistors just 0.03 microns in size, bringing super-computer performance to the desktop.	The process will let Intel build 10GHz CPUs that pack 400 million transistors onto low-voltage dies in just five years.	"As our researchers venture into uncharted areas beyond the previously expected limits of silicon scaling, they find Moore's Law still intact," says Intel.	Yeah, great. Does this mean game developers will do their part by upping polygon counts?

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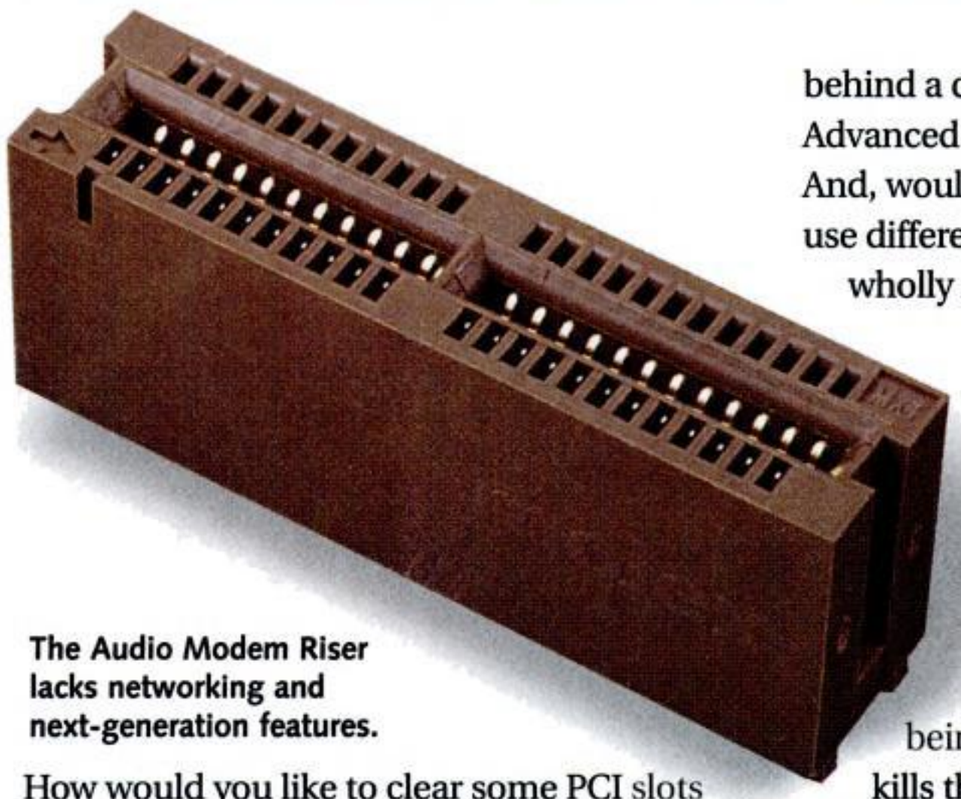
Riser Cards Go to War

Multi-function Add-in Cards Liberate PCI Slots—But Which One Will Win?



The Audio Modem Riser lacks networking and next-generation features.

How would you like to clear some PCI slots by off-loading your modem, audio, and networking jacks onto a single card that fits into its own dedicated motherboard connector? That's what Intel hopes to accomplish with its Communication and Networking Riser (CNR) card spec.

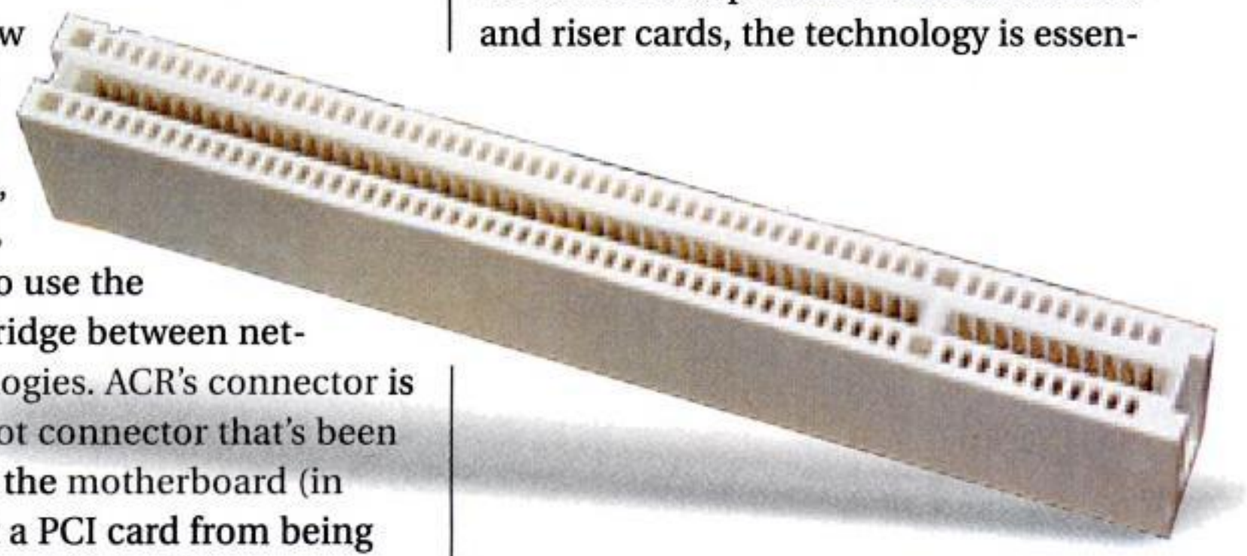
CNR cards and their "riser card" ilk tap into the modem, audio, and networking circuitry built into modern motherboard chipsets. The chipsets handle the actual processing duties (often with an assist from the CPU), while the riser cards serve as receptacles for all the attendant cabling. Because a single riser card costs significantly less than separate modem, sound, and Ethernet cards, PC vendors stick them into systems in order to cut costs. Indeed, vendors love exploiting the features that already exist in "integrated" motherboard chipsets. The problem is that no one can agree on a single riser card standard.

It's been a year since Intel introduced the CNR spec, and the standard continues to face resistance. In fact, a group of 55 manufacturers have banded together behind a competing interface called Advanced Communications Riser (ACR). And, wouldn't you know it, CNR and ACR use different mobo connectors, and are wholly incompatible.

So why can't we all just get along and agree on one connector? It's simple, says Conrad Maxwell, marketing chair for the ACR special interest group: "CNR basically locks customers into buying Intel chipsets."

Maxwell says that besides being proprietary, CNR completely kills the previous Audio Modem Riser (AMR) spec in which companies have already invested heavily. Ironically, Maxwell says, Intel convinced everyone to adopt AMR in 1998 and is now telling everyone to dump it.

Unlike CNR, ACR maintains AMR compatibility while adding new features such as support for 10/100 Ethernet, HomePNA, DSL, and the ability to use the riser card as a bridge between networking technologies. ACR's connector is actually a PCI slot connector that's been repositioned on the motherboard (in order to prevent a PCI card from being accidentally jammed into it).



A consortium of companies are working to introduce a competing riser spec called Advanced Communications Riser that uses a standard PCI slot mounted backwards on motherboards. ACR promises to offer connectivity for years to come.

Patt Correia, the CNR initiative manager at Intel, describes the opposition's claims as "totally bogus."

To lend credence to its position, Intel points to such boards as MSI's K7T Pro, which features a CNR connector. Not only does the K7T use a non-Intel chipset, it even supports AMD CPUs. In fact, Intel says, ACR is the less open spec because it won't work with Intel's newer chipsets. Intel's latest chipsets, such as the 850 and 815EP, use the new ICH2 controller chip that uses a reduced pin-count interface for LAN connectivity. Intel says fewer pins aids in building electrically quieter motherboards that are easier and cheaper to design.

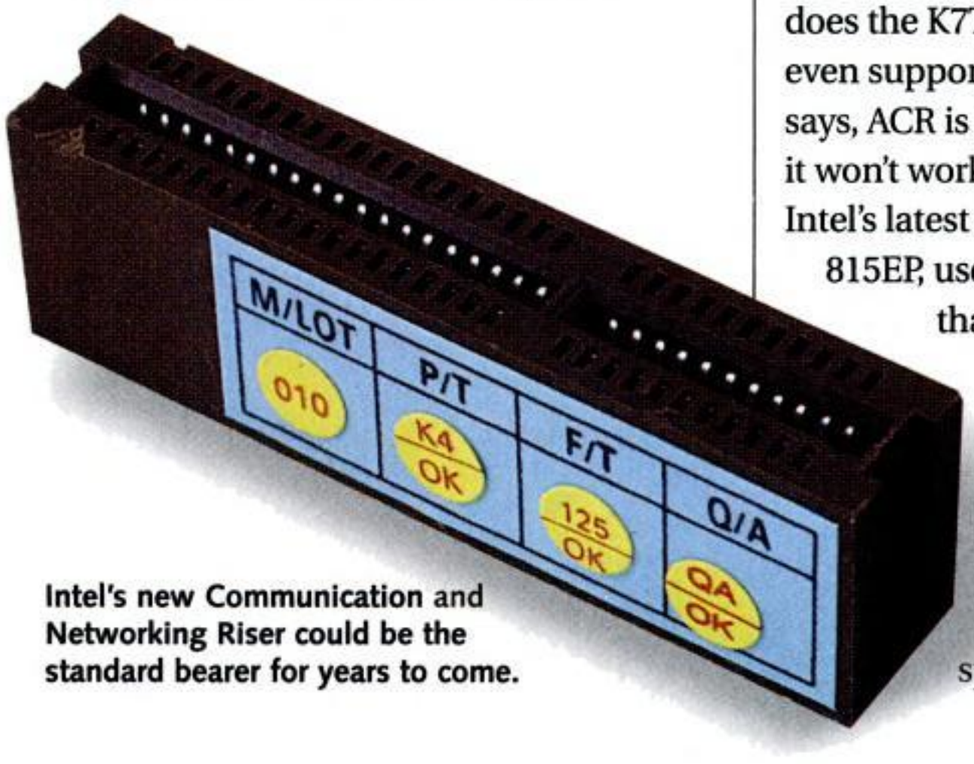
As for the original AMR spec, Intel says it had to die an untimely death because of its lack of plug-and-play and because it "eats" a PCI slot (by design, no AMR boards can be built with six PCI slots; CNR slots, however, can share a space with a PCI slot).

Both Intel and the ACR camp claim their respective specs can better accommodate future technologies, such as USB 2.0. So who's right? Bert McComas, of InQuest Market Research, says he believes ACR may ultimately have the longer legs and doubts Intel's claim that CNR is truly an open spec.

Both CNR and ACR are tied to the designs of individual motherboards. For example, if a motherboard maker doesn't route the appropriate audio wires to the riser connector, the integrated audio features in the mobo chipset won't work—thus negating the utility of the audio jacks on the riser card. Because of the symbiotic relationship between motherboards and riser cards, the technology is essentially the domain of system OEMs. It's therefore unlikely that you'll soon find a CNR or ACR card at your local CompUSA—a damn shame, considering that many of today's retail mobos have integrated chipsets that system hackers would like to exploit. For the foreseeable future, you should expect to continue using PCI cards for audio, modem, and networking duties.

In the meantime, CNR and ACR will fight for dominance. Hopefully, if a winner does emerge, it will enjoy enough of a groundswell to warrant a place on the shelves of your local retailer.

—Gordon Mah Ung



Intel's new Communication and Networking Riser could be the standard bearer for years to come.

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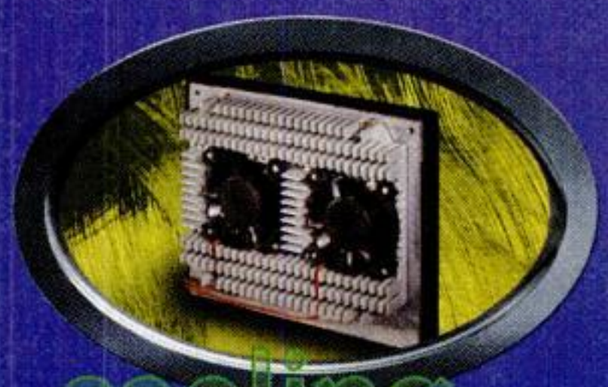

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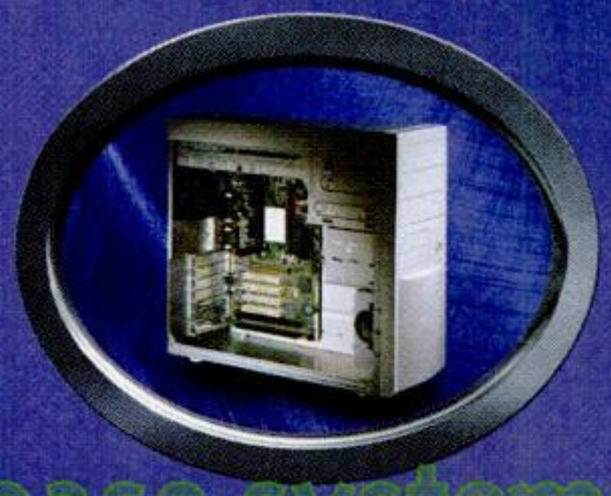

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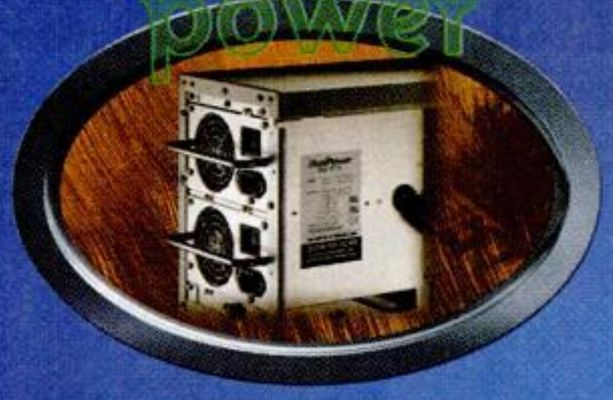

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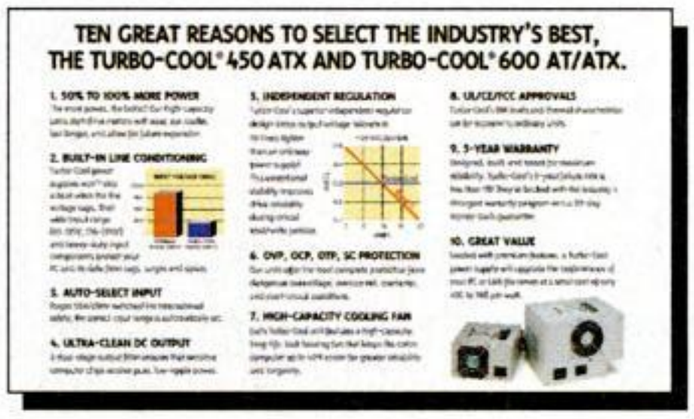
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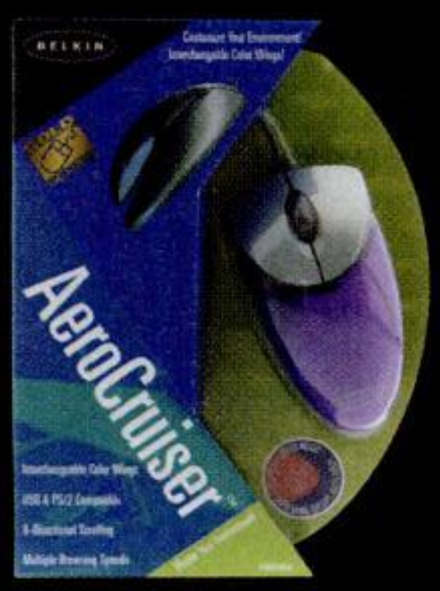

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▶ Maximum PC takes a bite out of bad service and gear

WATCHDOG

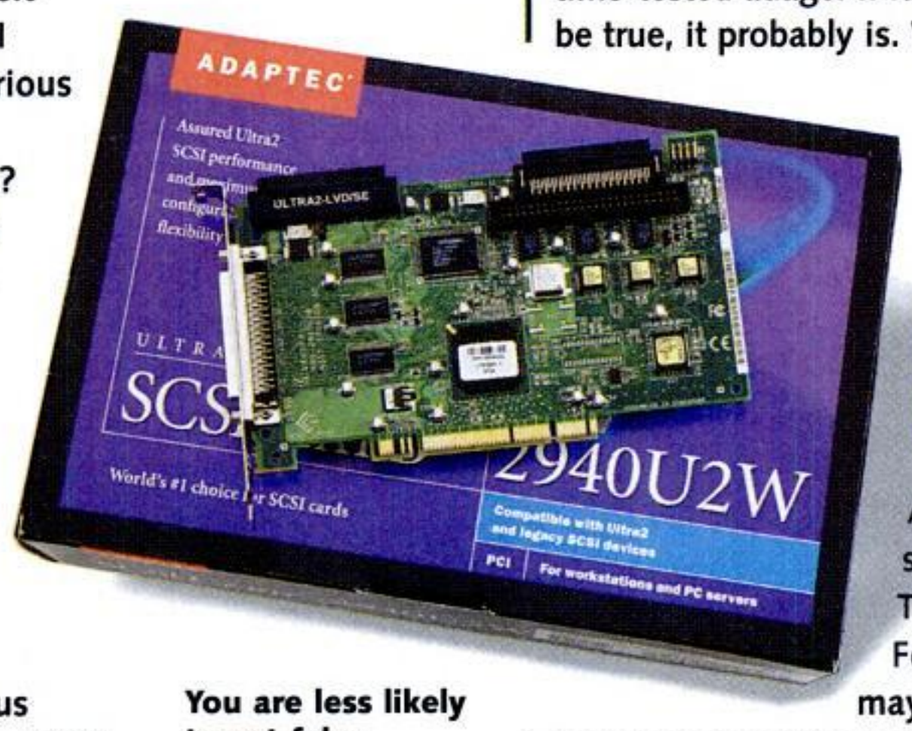
ILLUSTRATION BY SCOTT LAUMANN

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **Watchdog @maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

MARSHALS, ADAPTEC SEIZE COUNTERFEITS

Is your Adaptec 2940-series Ultra2 SCSI card a misbehaving, unreliable beast? The problem could be far deeper than corrupt drivers or an IRQ conflict. In a story that illustrates just how far counterfeiters can go, U.S. Marshals seized nearly 5,000 counterfeit Adaptec 2940 and 3940 SCSI adapters in October from various retail stores.

What are counterfeit cards? In this case, they're complete copies of Adaptec SCSI cards using actual Adaptec AIC controller chips, according to Adaptec VP and general counsel Dana Miles. The counterfeit cards came with counterfeit documentation and driver disks and sold for less than the real deal.



You are less likely to get fake hardware if you buy the retail boxed version.

"The burning question to us is, Where are they getting the ASICS (chips) from?" Miles said. Adaptec doesn't believe chips were stolen en masse because that would have been noticed. Miles believes the chips in the counterfeit boards were likely stolen in very small quantities.

"Some looked good and some looked shoddy," he said. "It depends on who was duplicating them." Adaptec engineers can spot the fakes, but most consumers would never know they got passed a bad penny. Even though some counterfeit boards may look authentic, bogus boards tend to have a much higher failure rate than the real deal, and some were in fact DOA, according to Miles.

Almost all of the counterfeit products were packed in OEM trim—that is, bare cards in anti-static bags. Authorities said the counterfeit cards were seized from: GlobalNet Computer Components of Canoga Park, CA; Amcotec, Inc. of Livermore, CA; Lexy Pacific Corp. of Mountain View, CA; Globe Cargo, Inc. of Hawthorne, CA; Unisun Group, Inc. of Foothill Ranch, CA; and Global Source Technology of Thornton, CO.

How do you avoid getting a counterfeit product? One way is to avoid buying OEM-packaged components, as most fakes are sold in this type of bare-bones packaging. Also look for signs of poor packaging and badly printed documentation—this can be a tip-off of evil lurking inside. Of course, "proper" packaging shouldn't make you completely confident, either. To wit, counterfeiters are now reproducing Microsoft's edge-to-edge CD hologram that's used to identify legitimate copies of Windows Millennium, *Professional*, and *Office 2000*. The edge-to-edge hologram is thought to be one of the most tamper-proof designs available today. Expect a *Maximum PC* update in coming months on how to spot these fakes.

If you simply must buy OEM-packaged products, buy from a dealer that you trust. The Dog's final advice is the time-tested adage: If it seems like the deal is too good to be true, it probably is. Woof.

QUANTEX AND CYBERMAX UPDATE

Are Quantex and CyberMax subsidiaries of bankrupt Fountain Technologies or just partners? For consumers, that question may mean the difference between recouping a little cash or getting bupkis. At this point, the relationship between Fountain, Quantex, CyberMax, Pionex, and Inteva continues to be a murky one.

Fountain Technologies, once a billion-dollar company, filed bankruptcy last year, taking several of its "affiliates" down with it. Once thought by industry analysts to be a parent company, it appears Fountain Technologies' relationship with Quantex and CyberMax is much more complex.

According to Fred Levy, an attorney with Traub, Bonacquist, and Fox, Fountain has a stake in the other companies, not sole ownership of them. "Fountain manufactures computers and sells them to a lot of companies, but each is its own company," Levy said. Levy is representing the people owed money by Fountain. In fact, Levy said CyberMax, Quantex, Pionex, and other companies all appear to owe Fountain buckets of cash.

Since Fountain was the only company that filed for bankruptcy, consumers cannot file claims for what they're owed in defaulted warranty and support.

"Some looked good and some looked shoddy. It depends on who was duplicating them."

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"There's not a whole lot that can be done [by consumers]," Levy said. M.T. Chang, president of Fountain and a major figure in all of the defunct companies, continues to avoid The Dog. Chang did not respond to phone messages and e-mails sent to him. Mr. Chang, your customers want to hear from you.

Some relief may come to owners of Pionex PCs, however. According to a source who asked to remain anonymous, a company is currently in negotiations to purchase the Pionex name. As part of the deal, the company may agree to offer limited support and warranty services for Pionex PCs. Stay tuned for more information.

GEFORCE2 SLOW X

"Does AMD expect customers to keep the box and everything for three years?"

Dear Dog: I recently bought a computer that came with a GeForce card. The card turned out to be the cheap-o MX version of the GeForce series. The GeForce2 MX is listed by nVidia with a clock speed of 166MHz, but mine says it's clocking at 142MHz. Did I get ripped off, or did I get one that wasn't listed on the site?

— Adam Mitchell

"I believe AMD is being unreasonable with its RMA requirements, and disingenuous regarding the fragility of its newer cores."

THE DOG RESPONDS: The Dog chewed bones with nVidia spokesman Brian Burke who said that nVidia specs the GeForce2 MX GPU to run with a core clock of 175MHz and memory clock of 166MHz. However, manufacturers are not restricted from varying from this spec; indeed, many offer GeForce cards both faster and slower than the spec.

Your options are to contact your PC vendor and request to exchange your GeForce card for a faster card or to return the entire PC for a refund. Be advised that you may end up paying for the shipping and handling. Another option is to overclock the sucker. GeForce2 MX cards with extra cooling are reported to hit fairly high speeds when overclocked. The surprise of varying specs could be avoided altogether by asking the system vendor for specifics on videocard speeds and requesting that those speeds be listed on the invoice.

CRACKED CPU

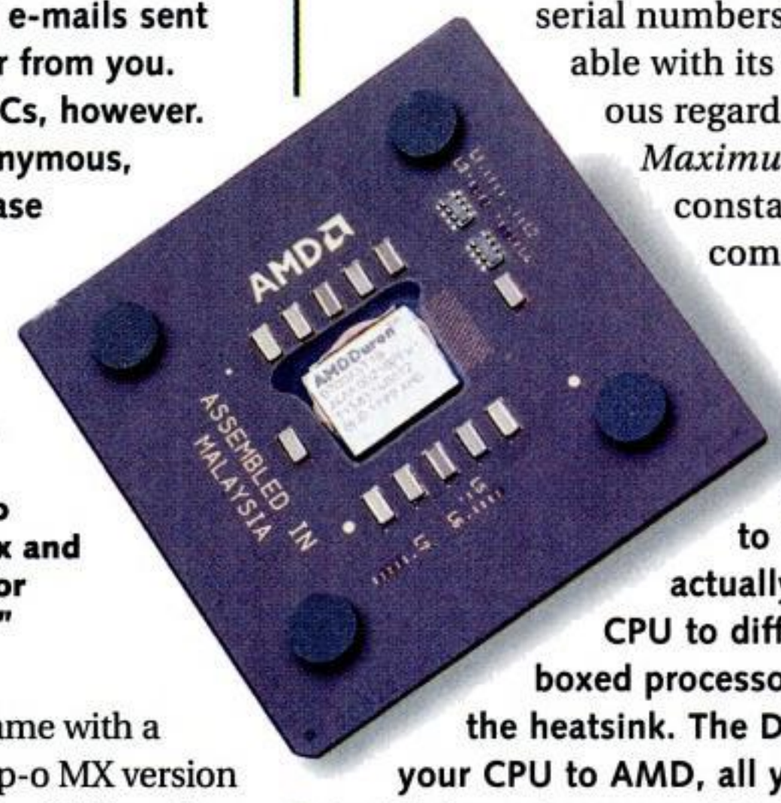
Dear Dog: As a loyal fan of AMD, I am stunned by its RMA policy. I recently purchased a boxed 700MHz Duron processor (instead of buying a cheaper OEM version) because it came with a three-year warranty.

Much to my surprise, the core cracked after a better heatsink was added to the Duron, making the processor inoperable. I've come to realize this is a common problem on the Thunderbirds, as well. I called AMD to apply for an RMA and was approved, but only if I returned the processor with the original box, manuals, and heatsink.

My questions is, Does AMD expect all customers to keep the box and everything for three years? When I have an RMA issue with Intel CPUs, its only request is that I send back the processor.

Doesn't AMD have a way of verifying boxed CPUs by their serial numbers? I believe AMD is being unreasonable with its RMA requirements and disingenuous regarding the fragility of its newer cores. *Maximum PC* users tweak their systems constantly, and a better heatsink is a common tweak.

— Moses Garcia



THE DOG RESPONDS: The Dog talked with AMD officials about Moses' situation. Much to The Dog's surprise, AMD doesn't actually use the serial number on the CPU to differentiate between an OEM or boxed processor; it uses the serial number on the heatsink. The Dog also learned that to return your CPU to AMD, all you need is the CPU, the original heatsink, and your receipt. Contrary to the information Moses received, the box and manual aren't necessary.

AMD says there have been reports of cracked or crushed cores, but that many of those incidents are due to people using the wrong heatsink. Many people use heatsinks designed for Intel Socket 370 CPUs, which have a lower profile. Fitting a Socket 370 cooler on a Thunderbird Athlon or Duron can crush the core. AMD officials say that other reports of crushed cores are related to poorly engineered heatsinks that require the user to push down with too much force on the processor. While this sounds like a lame explanation, The Dog can verify that some of the existing heatsink designs are indeed piss-poor.

Be aware that AMD specs the stock heatsink to work in almost any situation and says there's no need to change it. If you use another heatsink, you technically void the warranty, just as you do if you overclock.

BEST NET SCAMS OF 2000: AUCTIONS

While you're still more likely to get scammed in online auctions, getting burned in e-tail shopping, work-at-home schemes, and Nigerian money offers is more common than it's ever been, according to the Internet Fraud Watch at Fraud.org. The organization compiled complaints for the first nine months of 2000 and found a shift from the previous year. The most interesting increase is the Nigerian money offer, in which strangers offer vast financial returns if you make small investments or loans. Sometimes these offers lure unsuspecting marks to a foreign land, where they're kidnapped and held for ransom. Here's Fraud.org's top-ten list of fraud schemes for the first nine months of 2000, broken down by percentage of all complaints filed with the National Consumers League.

Online auctions	79%
General merchandise sales	9%
Work-at-home	2%
Internet access services	2%
Advance fee loans	2%
Computer equipment/software	1%
Nigerian money offers	.7%
Information adult services	.6%
Credit card offers	.6%
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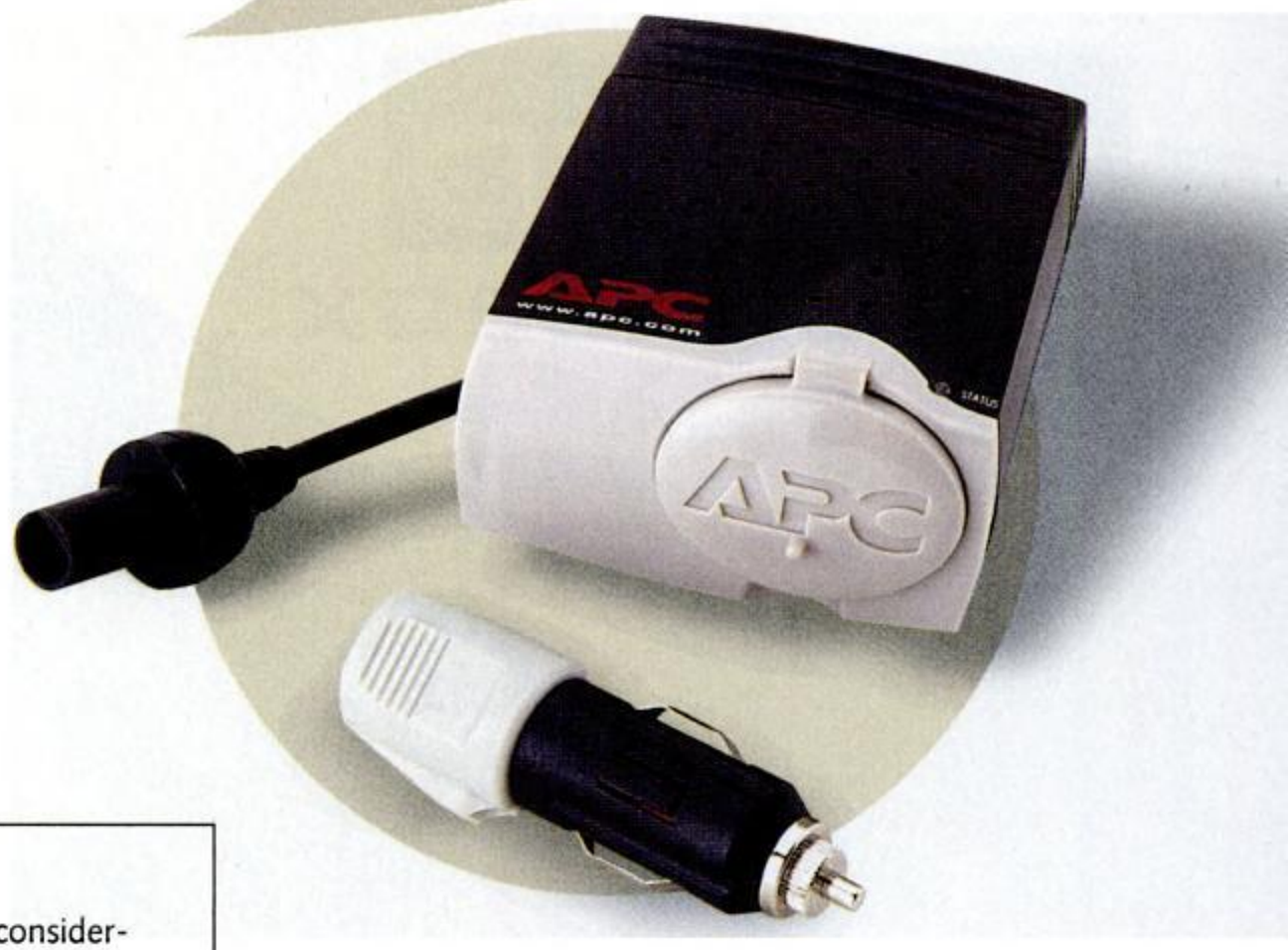

Motient eLink fortified with Yahoo

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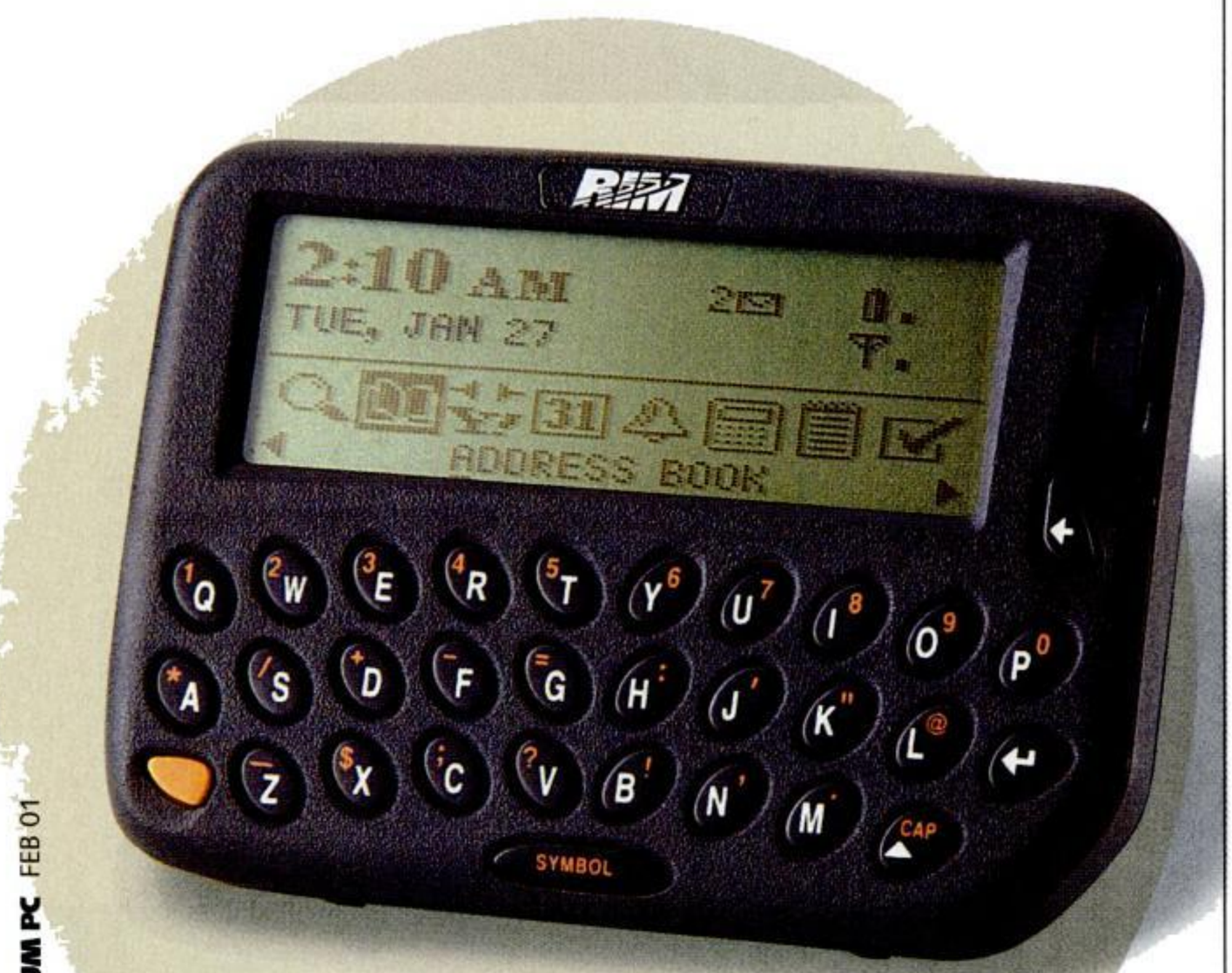

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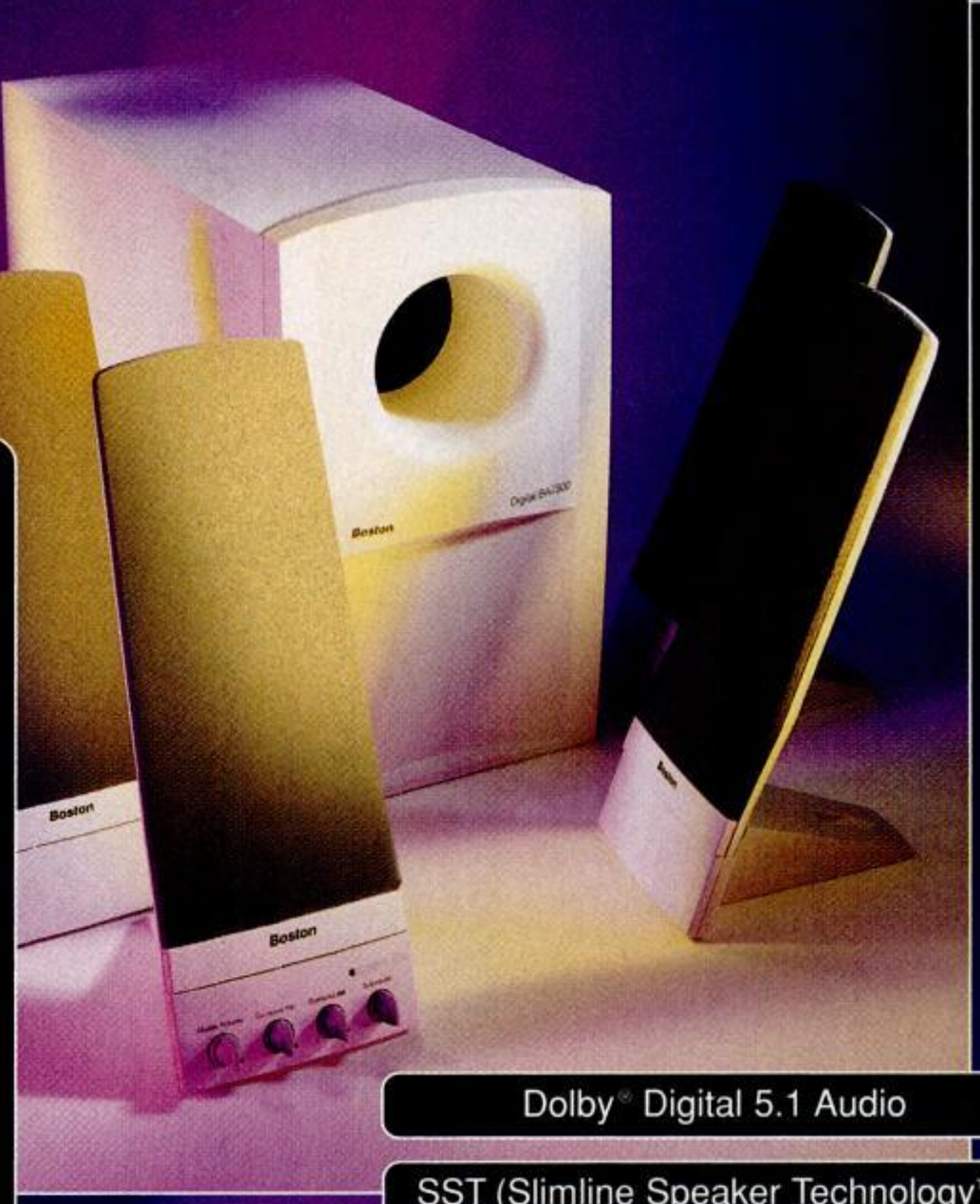

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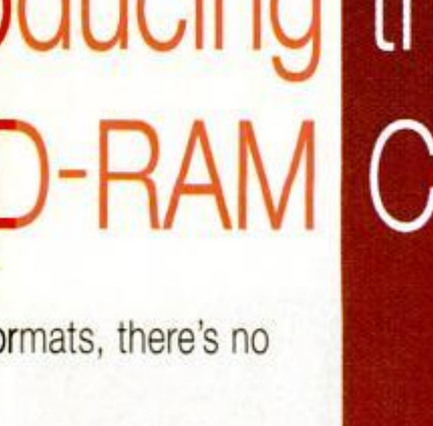

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▶ TOMORROW'S TECHNOLOGIES EXPLAINED

FAST FORWARD

Where Are the Beethovens?

IT'S TIME TO CHANNEL THE CREATIVE POWER OF YOUR PC

In the mid-1980s, one of my colleagues wrote a rousing magazine editorial called "A Million Beethovens." He predicted that PCs would open up vast realms of creativity for a new generation of aspiring artists and musicians. No longer would the expense and difficulty of musical instruments and other artistic tools erect a barrier to creative expression. Affordable, easy-to-use technology would bring a virtual symphony orchestra to anyone's command, inspiring the rise of a million Beethovens.

Well, where are they? It's 15 years later and we've got the technology. But somehow I don't think my colleague had Ricky Martin's pelvic thrusts or Britney Spears' belly-button in mind.

OK, that's not fair. There's lots of great music and visual art today. Still, I suspect we aren't approaching our full potential. We take our powerful PCs for granted and don't realize what they can do—or more to the point, what they can help us do.

With a PC and a few hundred dollars' worth of equipment, you can set up a multitrack recording studio that was unimaginable a generation ago. The Beatles recorded their famous *Sgt. Pepper* album on expensive, custom-built, four-track tape recorders. Today, you can essentially duplicate that equipment for under $200. Electronic keyboards that put the early Moog synthesizers to shame cost as little as $100. Thanks to the computer-controlled woodworking machines in modern factories, mass-produced electric and acoustic guitars of decent quality are cheaper than at any time in history.

Visual artists haven't been left behind, either. With an under-$500 flatbed or film scanner and an inkjet printer, you've got a digital darkroom that offers unparalleled image control. True, digital quality doesn't quite match what a skilled darkroom worker can achieve with conventional materials. But it's getting close, and for some types of images, the difference doesn't matter.

If you're an aspiring filmmaker, you're really living large. The least-expensive film format available a generation ago was Super 8—as fuzzy as a hangover, as clumsy as spaghetti, and so costly that a two-hour feature film would require hundreds of dollars for film and processing alone. Film editing with Super 8 or even 16mm was a vision-blurring ordeal that required scissors, splicing tape, and aspirin. Today, videotape is so cheap that footage is virtually free. Camcorders with zoom lenses cost less than a good still camera did in the old days. Powerful video-editing software has capabilities that until recently were unavailable outside of the best-equipped Hollywood studios and SFX shops.

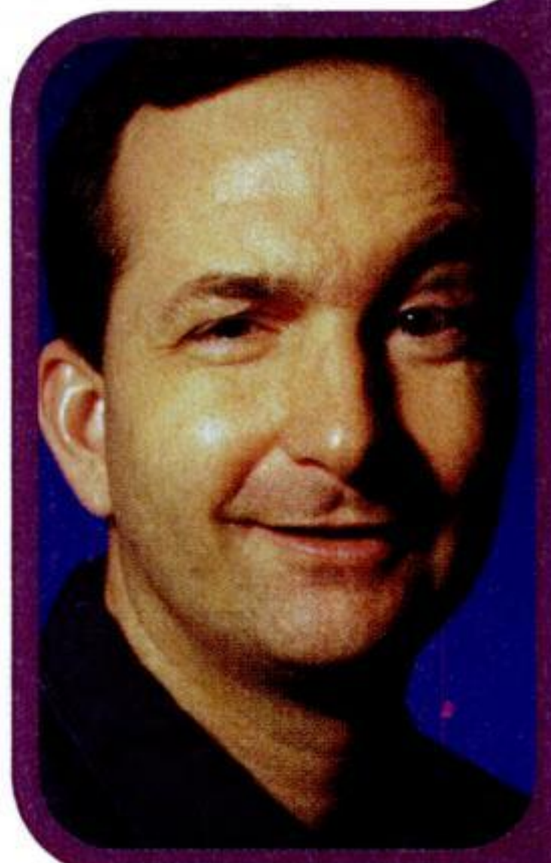
With a PC and a few hundred dollars, you can set up a multitrack recording studio that was unimaginable a generation ago.

So where are the young Beethovens? The Avedons? The Hitchcocks? Maybe they're sitting on their butts playing games, or trading other people's music with *Napster*. That's OK, to a point. Artists need an audience, PCs are great for recreation, and not everyone is blessed with the creative spark. But I suspect there are tons of unrealized potential out there.

Regardless of what you think of *The Blair Witch Project* as art, at least it proves that a small group of rogue filmmakers on a shoestring budget can outflank the bloated Hollywood studios and produce a work that entertains millions of people. Of course, to get their film shown in theaters, the *Blair Witch* makers had to sign a conventional distribution deal with The Man. The tools of creation are more affordable than ever, shifting the bottleneck of popular art to the distribution channels.

The Internet will shatter that bottleneck forever. The cost of web space and bandwidth is rapidly approaching zero—it's already zero in some cases. You can record an original song, take a photograph, make a film, draw an illustration, or write a story, then make your work available to the world before going to bed. Never, ever forget how revolutionary that is. Attracting attention to your work still isn't easy, but that will always be true. At least now the art is accessible.

Best of all, the central tool that makes all this possible is the PC you already own. If you don't think it's powerful enough, don't worry. Even Beethoven had to start somewhere. Plug a keyboard, electric guitar, or mic into your soundcard and learn how to use a sound editor. Scan some photos and experiment with an image editor. Grab a camcorder and make a documentary about your friends, your neighborhood, your family. Draw something. Write something. Create something. *Just do it!*



TOM HALFHILL
was senior editor at *Byte* magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com**.

Random Thoughts

▶ My favorite sound editor is Syntrillium Software's *Cool Edit*, a shareware program available for free evaluation. As a teen, I used to patch together three or four tape recorders to do things I can accomplish with a few clicks in *Cool Edit*.

▶ For photo editing, Adobe *PhotoShop LE* is king—the full version has prepress stuff you don't need. *PhotoShop* blows away Adobe's woeful *PhotoDeluxe*, which has an amateurish user interface. Get the real thing.

▶ I don't shoot motion video so I can't recommend a video editor. But do me and your audience a favor—don't show unedited video! It's unwatchable. If you can't edit, save the footage until you can.

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▶THE SCOOP FROM A MAJOR PLAYER

GAME THEORY

T. LIAM MCDONALD
is a veteran gamer and game writer. His reviews appear regularly in *PC Gamer* and other publications. Write him at **tmcdonald@maximumpc.com**.

If you're of a certain age, you might remember the old Heath electronics catalog. Its slick pages offered hundreds of kits that provided all the parts for making radios, oscillators, atomic accelerators, and the like. It was all part of that model-train/rocket/airplane build-it-yourself era when kids had access to only seven TV channels. About 43 people still do this kind of hands-on hobbying, but the same do-it-yourself impulse has bubbled to the surface in another arena. Game mods and total conversions are the model kits of the Information Age, and, like other hobbies, the results vary widely in quality. Some are reaching such high levels of professionalism that they're being released as standalone games by major publishers rather than being relegated to the "user-made levels" directory of an add-on disc. Two such products—*Gunman Chronicles* and *Counter-Strike*—illustrate how different the results can be.

If you haven't experienced *Counter-Strike* by now, you've missed one of the most sublime gaming pleasures of the past year. During its year-long open beta phase, when it was made available as a free download, *CS* spread like wildfire, eventually spawning more multiplayer servers than *Team Fortress*. *Counter-Strike*'s more sophisticated version of team play transplanted the anti-terrorist elements of *Rainbow 6* and *SWAT 3* to the *Half-Life* engine. Unlike *Team Fortress*, *CS* missions emphasize realism and team tactics, with one-shot/one-kill weapons modeling. The core of its appeal is this wide selection of real-world weapons, which must be bought with cash earned for successful missions. The design is almost perfectly balanced to force a true team experience—players must provide cover for each other and work together. The result is a more tense and satisfying experience than standard *TF* play.

Sierra has taken *Counter-Strike*, which was developed by a band of hardcore fans lead by Minh "Gooseman" Le, and published it as the lead title in a bundle with some other mods. All of its strength and individuality is intact, but it's hard to know what to make of a $30 game you've been playing for free for the past year. One of the amazing things about *CS* is that it's a true triumph of quality over hype. This was a phenomenon created entirely by word of mouth, without any retail participation or advertising. Of course, the phenomenon didn't create much revenue—a fact that makes for a nice grass-roots gaming story but provides little incentive to continue game development. Sierra's participation will surely bring *CS* to a wider audience (something long-standing players may reasonably dread) and generate some cash. But the real story is that a product of such high quality emerged from sheer love and devotion to a hobby.

Strangely, Rewolf's ostensibly promising *Gunman Chronicles* total conversion for *Half-Life* fails where *Counter-Strike* succeeded. Among the sea of *Half-Life* conversions, *Gunman* was singled out for stand-alone publication by Sierra, which means someone saw the promise of this independent effort. Crafted by a team of far-flung amateur modelers and level-designers, *Gunman* has always been a project to watch. The models are quite good and the elaborate event scripting is reminiscent of *Half-Life*. The story and setting are top-notch, creating a quirky science-fiction epic with an old-west feel. It would have been an impressive and popular download.

But once a game gets saddled with a price, retail shelf space, and an advertising campaign, expectations rise sharply. Whereas *Counter-Strike* meets those expectations, *Gunman Chronicles* does not. It falls flat in level design, which is far too linear and uninspired. It's a case of no one watching the big picture; great effort has been expended on very nice individual elements, but no unifying sense of purpose or design emerges. It has all the elements for success, but they never gel. The gestalt never kicks in, and it winds up being less than the sum of its parts. Yet it is something everyone involved could show to a game company with pride and a reasonable assurance of a job offer.

Both these titles are the result of Sierra—once rightly hated by fans—reaching out to the amateur programming community with expos and developer input. Sierra is one of the few companies that really nurtures the mod community, knowing full well that future programmers and designers are to be found within the ranks of hobbyists. ✹

A Tale of Two Conversions

RESULTS VARY WHEN GAMERS DESIGN THEIR OWN GAMES

Game mods and total conversions are the model kits of the Information Age.

Random Thought

▶ *RealMYST* is a novel idea, but, like the original, it's an exercise in aggravation. Cyan has meticulously re-created *Myst* using a new 3D engine with complete freedom of movement. Unfortunately, it runs so poorly that frame rates approach the slide-show style of the original, negating any benefits of a 3D environment. Although a new age has been added and the visuals remain quite striking, the gameplay is mired in the same tedious code-breaking and switch-throwing puzzle mess of the original. I had more fun on my 29th viewing of my son's *Blue's Big Movie Musical* DVD. Instead of being a retro-reinvention of a justly famous title, *realMYST* is merely a pointed reminder of why the press dumped on the original so heavily when it came out.

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▶CREATING A NEW PC

CONVERGENCE

Screw TiVo, I've Got Better

FIVE SIMPLE FEATURES DEFINE THE ULTIMATE SET-TOP BOX

I've been hearing about set-top boxes for five years. This elusive magical box will sit on top of our HDTVs and do everything our computers, game consoles, and VCRs do, only better. Early adopters want them and are lining up to buy them *now*. Of course, these first-gen boxes are only capable of a fraction of the things that I'd like to see the perfect convergence box do. What I want to see isn't exactly an Internet appliance or a broadband gateway, but a little of both. The perfect set-top box will also form the center of a home entertainment system, as well as a home network, and perform these five simple functions with aplomb:

Web and e-mail

First came e-mail, then came the web. And so it shall be with Internet appliances. The first IAs were simple machines with only rudimentary web browsing and e-mail capabilities. A good Internet appliance, however, will provide the robust Internet experience that's already available via PCs. This means every member of a household gets access to his or her own e-mail account and bookmarks via a seamless interface.

Blah, blah, blah. It's tough to get excited about web browsing and e-mail, but it's easy to get angry when these functions don't work. The ultimate set-top box will therefore have support for all the web standards (Flash, DHTML, XML) as well as streaming video. And thanks to a FireWire or ColorStream video output, you should be able to browse in any of the high-res HDTV formats your TV supports. The icing on the cake? The ability to save downloaded media to your hard drive.

High-speed communication

In order to fulfill all of my consumer-electronics desires, my set-top box will have to have a high-speed broadband connection. Once you have a high-speed connection to your PC, there's no returning to the land of 56K.

Your set-top box will serve as a broadband router, sharing your Internet connection with any networkable device in your house via standard Ethernet, Wi-Fi compatible wireless Ethernet,

Wouldn't it be nice to watch the "Bewitched" marathon your PVR recorded for you on your computer at work?

Bluetooth, or even a HomePNA phone line network. By integrating several different networking technologies, users will be able to connect their computers, PDAs, webpads, and even kitchen appliances to the Internet from anywhere in their houses.

Gaming

Naturally, the ultimate set-top box will include state-of-the-art 3D acceleration and gaming support. Ideally, the box would be capable of running all the major console games, but since that's never going to happen, we'll just say that it will run games from a major platform—such as the PS2, Gamecube, or Xbox—along with PC titles.

Of course, you won't want pesky cables cluttering up your living room, so the perfect set-top box will include Bluetooth-style wireless connections for all your controllers.

TV recording and music playback

My perfect set-top box will also serve as a media store, handling the duties of both my high-def personal video recorder (HD-PVR) and digital audio jukebox.

I love my TiVo. In fact, my only gripes with the thing are that it doesn't do HDTV and it's not connected to my home network. It's fairly obvious why I want HDTV support, but why would anyone want a PVR connected to his home network? Answer: Streaming video and ease of configuration. The ReplayTV service already gives users the ability to program the ReplayTV unit from any web-enabled device as if they were sitting in front of their TVs, but we want more. Wouldn't it be nice to watch the "Bewitched" marathon your PVR recorded for you on your computer at work? [*In a word, Will? No.* –Ed.] Because your PVR is also the entry point of your network, the ultimate set-top box shouldn't have a problem with this.

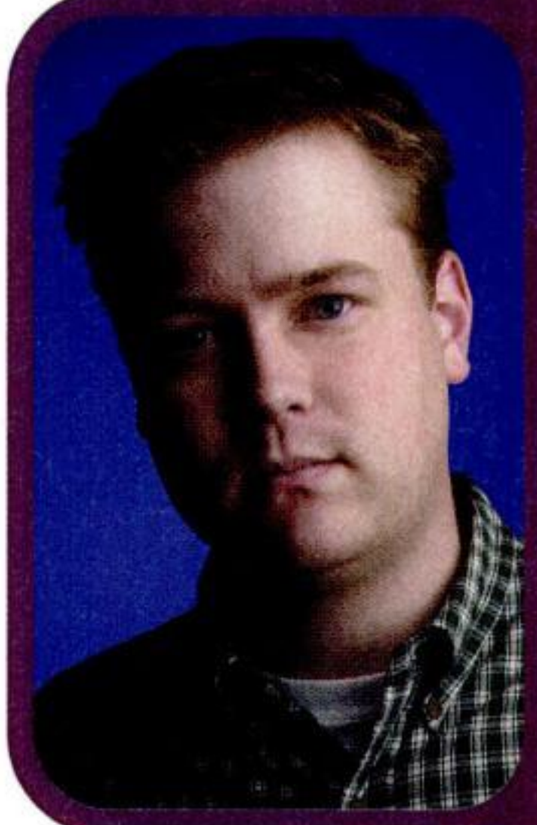
If your box can handle high-definition video, then digital audio shouldn't be a problem either. With a large enough hard drive, you should be able to store all the music you own on your set-top box and then access the tunes—and even add more music files—from any location with a network connection.

Household tasks

Because this box is the centerpiece of all data traveling through your house, it should include software that will help you manage your life. By including a group calendar for your family and integrating the ability to automatically synchronize with Bluetooth-enabled PDAs, the ultimate set-top box will help get your entire family to the right place at the right time.

***

So why didn't you get one of these boxes for Christmas? A well-equipped PC has the capacity to do all the things I mentioned, but the key problem for set-top boxes has always been their user interfaces. A well-designed interface that's accessible via the net and passes the "Mom test" will rule the world. Can product developers answer the challenge? I'm waiting patiently to find out.



WILL SMITH

Will Smith is *Maximum PC*'s technical editor. He has a consumer-electronics purchasing addiction and is looking to consolidate all of his vices into a single box. E-mail him at wsmith@maximumpc.com.

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BROAD

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Think you know broadband? Think again. We show you how to take your high-speed net connection to an even higher level.

By Will Smith

Almost anyone in civilized America can snag a broadband connection these days, but only a power user can master that connection and bend it to his will. If you haven't thought about your high-speed net hook-up since the day it was installed—if you've been content to just enjoy your new throughput speeds in a void, blithely downloading MP3s with no consideration for privacy, security, or how to get even more modem-busting performance—then you've been doing yourself a disservice. Broadband is tweakable, so it's time to get busy and become the master of your Internet domain.

Because broadband connections are active 24/7, they present a slew of security and privacy concerns that need to be addressed. And because broadband speeds can vary wildly from household to household and from city block to city block, you need to be sure that you're getting the connection speed you're paying for. On the flipside, you might actually be paying for speed you don't even need. Broadband may be the hottest trend since hula hoops, but $500 a year is a lot to pay for a service you're not actually using.

You say you haven't purchased broadband yet, or you're looking to change providers? No problem. This handbook will walk you through everything you need to consider before signing a contract. You say you're already hooked up? Perfect. We'll tell you how to get the best from your high-speed connection, and how to keep it from getting the best of you.

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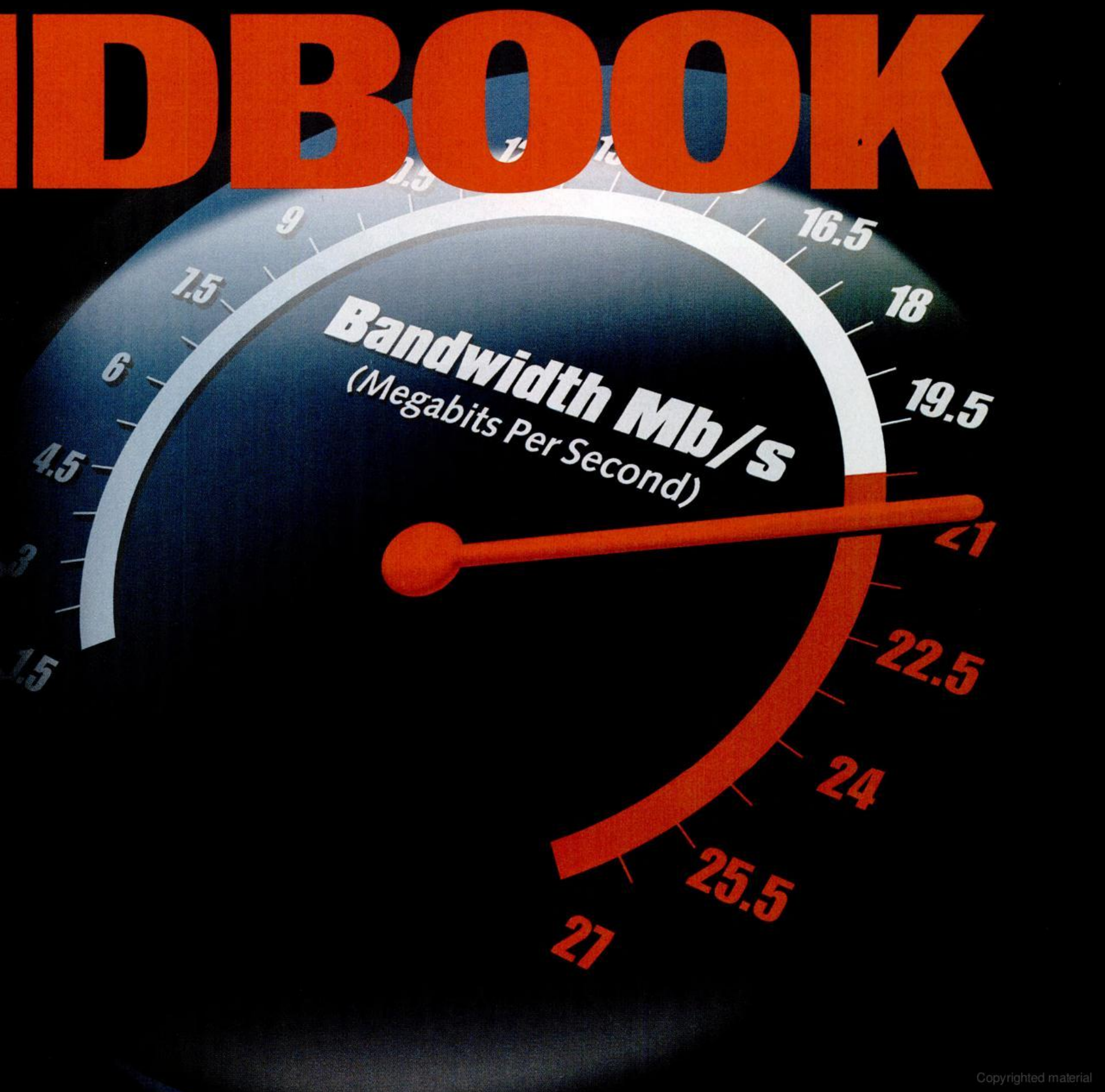
BROADBAND

HANDBOOK



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How to Pick the Right Provider

(or switch to a better one)

Don't go plunking any money down until you truthfully answer the following questions: How much time do you really spend online? How many things do you usually do at once while you're online? Do you have a specific interest, such as online gaming, that absolutely demands fast net access? Do you really *need* broadband?

Still sold on having a high-speed connection? Excellent. Now you've got some research to do on what services are available in your area and who your broadband provider will be (if you're lucky enough to have an option). Following are the issues to consider before putting your John Hancock on a contract.

Throwing light on a tough question: Cable or DSL?

Although the term "broadband" is an umbrella description for any sort of high-speed net access (including satellite and, arguably, ISDN, both of which are discussed below), you'll likely be choosing between one of two services: cable or a digital subscriber line (DSL). Which you invite into your home will depend partially on your computing habits, but more on what services are available in your little corner of the globe.

If you have access to both services and you're primarily interested in the fastest downloads possible, go for cable, which has very high theoretical throughput. Throughput measures the amount of data that can be moved across a connection in a given time period; it's usually represented in kilobits per second (Kbps) or megabits per second (Mbps). Know, however, that because all households on a cable node (usually around 30 or 40 homes) share the same finite amount of bandwidth, cable users on busy nodes typically end up with significantly slower connections. To minimize this problem, most cable companies cap upstream bandwidth at 128Kbps.

This cap, combined with the shared bandwidth problem, makes cable a poor choice for anyone who wants to run a web or FTP server—your slow upstream speeds will drive your online visitors insane. In fact, most cable providers specifically forbid any sort of server software on their connections. So if you're intent on uploading large volumes of data be sure your prospective cable provider won't balk. And if many people on your block already have cable Internet service, ask them if their download speeds during peak hours (typically weekday nights when everyone's home from school and work) even approach those advertised. If their cable modems perform more like 56K modems because everyone's sucking on the node at the same time, wait for DSL to hit your neighborhood.

Aside from a multitude of technological differences, the biggest difference between cable and DSL is that you don't share your DSL connection with anyone else in the neighborhood. Overall, DSL offers slower peak connection speeds than cable, but DSL connections usually have lower latency than cable connections (latency is the amount of time it takes data to get from your computer to the Internet; it's measured in milliseconds [ms], and it's the number to watch if you're concerned about ping times in online gaming). DSL is available in a few different flavors—not all of which are equally appealing. Which you're offered will depend on how far you're located from the phone company's Central Office (CO).

The asynchronous digital subscriber line (ADSL) is the most popular DSL option because it offers home users the best value for their buck. ADSL usually offers faster downloads than uploads, which is just peachy for most people since home users download far more information than they upload. ADSL's maximum upload and download rates drop as you get further from your CO, and most ISPs won't even attempt to install ADSL if you live more than 18,000 feet from your CO.

Another popular choice, the synchronous digital subscriber line (SDSL), offers equally fast upload and download rates. SDSL connections are usually more expensive than ADSL connections, but SDSL is the ultimate for a gamer, since synchronous connections allow for much lower pings than even normal ADSL lines can. It's also the best choice if you're looking to run a game, web, or file-sharing server, because of the high upload speeds it provides—we recommend 256Kbps as a minimum upload speed if you're looking to host a server. You'll also need to find an ISP that doesn't object to you running a server—perhaps the most difficult part of the process. SDSL is subject to the same 18,000-foot limitation that affects ADSL.

So, what are your options if your home is, in fact, located further than 18,000 feet from your phone company's CO? If you have an extra few thousand dollars a month at your disposal, consider a high-speed digital subscriber line (HDSL). HDSL delivers the T1 lines used by ISPs and businesses, and offers very high reliability. HDSL lines are also compatible with repeater hardware beyond 20,000 feet, in case you live far, far away from your CO. If that's too rich for your blood, check out an ISDN digital subscriber line (IDSL)—a replacement for standard ISDN. While it doesn't offer the speed of other DSLs, IDSL works well beyond the normal range of other DSLs—up to 50,000 feet, in fact.

Once you've wound your way through the cable versus DSL decision, it's time to choose a service provider—or to get in touch with the single provider serving your area. But even if that choice is dictated more by default than by decision, there are some basic features your service should include. Find out in advance what kind of modem you get (we'll talk more about modems on page 35), whether you buy or lease the hardware, whether you can get a static IP instead of a dynamic one, and whether the ISP uses Point to Point Protocol over Ethernet (PPPoE). Static IPs are useful if you plan to host a server or remotely access your home computer from work. PPPoE is another way to assign an IP address, but requires special software that your ISP will have to provide.

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How fast is your connection cruising?

When shopping for broadband, you'll be assaulted by numbers that all seem to tell different stories. In general, they all measure the speed at which information can flow over a network connection.

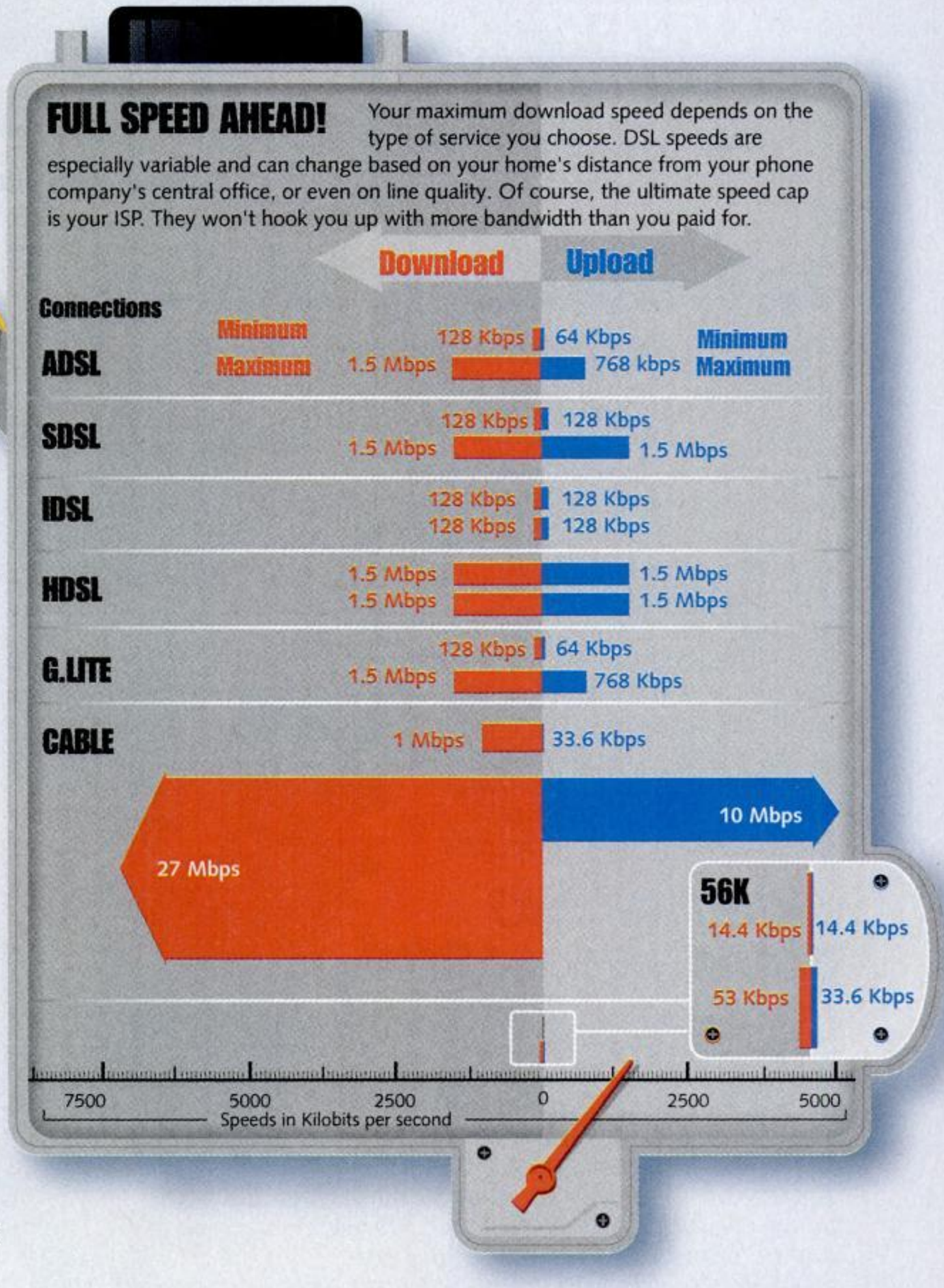
Most DSL providers report download rates in kilobits per second (Kbps). A bit is the smallest amount of data that a computer can understand; the kilo prefix means 1,000 of these bits are being moved. So, a connection with a throughput of 56Kbps—such as a traditional modem—is capable of transferring 56,000 bits each second.

Your browser or FTP program reports transfer rates in kilobytes per second (KB/sec). A byte is eight bits, so you can convert from Kbps to KB/sec by dividing the number of Kbps by eight. Likewise, you can convert bytes to bits by multiplying the KB/sec by eight. Pop quiz: What's the theoretical maximum throughput of a 56K modem, in KB/sec? It's 7KB/sec.

Think you've got it all figured out now? Cool your heels, there's more. Cable providers usually report upload and download speeds in megabits per second (Mbps). You can convert megabits to megabytes (MB) the same way you converted kilobits to kilobytes, which is useful since most download speeds are measured in megabytes.

How do you compare the speeds of cable and DSL—that is, how do you compare Mbps and Kbps? By converting Mbps to Kbps. One Mbps equals 1000Kbps, so to convert Mbps to Kbps, multiply the Mbps by 1,000. So, a 1.5Mbps connection can also be said to run at 1,500Kbps.

To see some representative numbers for different types of services, check out the chart to the right.



Can you do better than the hardware your provider gives you?

Replacing the DSL or cable modem your ISP provides is a sketchy proposition. Because there are 18 incompatible standards for DSL and almost as many for cable modems, most ISPs will only provide you with technical support if you use one of the modems they sell. And, as it happens, very few places other than ISPs actually sell DSL and cable modems to end users.

In spite of this, the right modem upgrade will, in some cases, get you access to advanced features such as the ability to connect multiple computers to your connection or higher download or upload speeds. For example, if DSL provider X only supports USB modems, and DSL provider Y will give you an Ethernet modem, you definitely want to use provider Y.

The main consideration when picking a broadband modem is its interface. Currently, three interfaces are available: Ethernet, USB, and PCI. We prefer Ethernet modems because all OSes that support Ethernet cards support them and because they allow you to easily make your broadband connection available to multiple computers. USB and PCI modems are generally plagued by poor driver support in non-Windows OSes, and neither works well with hardware broadband routers. If your ISP wants to stick you with an internal PCI or USB modem, just say you're a Windows NT4, Linux, or BeOS user—even if you're not—because those OSes lack driver support for PCI and USB modems. That should force your ISP to give you an Ethernet modem.

In general, we don't recommend that you ever acquire a DSL modem from someone other than your ISP, but when it comes to cable, you may have some options. There's a fairly well-accepted standard for cable modems, called DOCSIS; if you have a DOCSIS-compliant cable modem (check the modem for a Cable Labs certification sticker) and your cable company doesn't mind, go ahead and dig around the net for the DOCSIS-compliant modem of your choice. If your cable modem doesn't have a CL certification, you're probably stuck with what they gave you.

For your comparing pleasure, we've provided details on a few popular cable and DSL modems on page 35.

Not all modems are created equal

We looked at some of the more popular cable and DSL modems that ISPs are providing subscribers with and compared their features and top speeds. It may be worth your while to trade up to a modem that offers connection-sharing, but don't expect your connection to magically get faster. ISPs usually cap connection speeds at their end, so you may never have the chance to push the modem to its limit. Check with your ISP before you buy to see if an upgrade will actually get you better service.

	Modem Name	Modem Type	Notable Features	Top Download Speed*
	Motorola CyberSURFR	Proprietary cable	The CyberSURFR's Ethernet interface allows connection to an external hardware router to share Internet connection with multiple computers.	10Mbps
	3com Cable Modem TMI	Proprietary cable	The TMI's internal PCI interface should be avoided at all costs.	10Mbps
	Toshiba PCX1100	DOCSIS cable	The Toshiba PCX1100 is capable of sharing its connection with up to 16 PCs.	10Mbps
	Cayman Systems 3220-H	ADSL	The Cayman's integrated four-port hub and router allow it to share the connection it provides with more than one PC without an external router.	8Mbps
	Alcatel Speed Touch Home	ADSL G.Lite/ G.DMT	The Speed Touch Home's Ethernet interface allows connection to external hardware.	8Mbps
	3Com OfficeConnect 840	SDSL	The OfficeConnect 840 includes a four-port hub to allow easier connection sharing.	1.5Mbps
	Efficient Networks SpeedStream 5260	ADSL DMT	The SpeedStream 5260's Ethernet interface allows connection to an external hardware router to share Internet connection with multiple computers.	8Mbps

*The top speed your connection is capable of is usually regulated by your ISP, not the hardware on your end. This means that upgrading your hardware probably won't result in any speed improvement.

Top Broadband ISPs

Unless you've got scads of time and money on your hands, you probably can't afford to test-drive multiple broadband services in search of the right one. Thankfully, the team at DSLreports.com has created a great independent resource for people shopping for broadband on the net. Users submit reports of their experiences with broadband providers and assign the provider a score between 1 and 5 (5 being the best); the list is updated weekly. Because DSL Reports isn't backed by any broadband provider or telco, its reports are impartial, but of course, no rating system is infallible. Before you sign on with a provider, you should still solicit opinions from someone in your area who's using the service.

As of press time, the following were the top five ISPs in each DSL Reports category, in order of user ranking.

Top National DSL ISPs

1. Sprint Broadband **www.sprintbroadband.com**
2. MegaPath Networks **www.megapath.net**
3. Speakeasy.net **www.speakeasy.net**
4. Bell Canada **bell.sympatico.ca**
5. ProdigyDSL **dsl.prodigy.net**

Top Cable ISPs

1. Optimum Online **www.optimumonline.com**
2. RoadRunner **www.roadrunner.net**
3. ProLog **www.prolog.net**
4. @Home **www.home.com**
5. MediaOne **www.mediaone.net**

Top Regional ISPs

1. August.net Services (Southwestern U.S.) **www.august.net**
2. Global Telecom (Northeastern U.S.) **home.gti.net**
3. CompuHelp Internet Access (Eastern Seaboard, Southeast) **www.compuhelp.com**
4. 1699 Access (varied) **www.1699.com**
5. Southern Star (Louisiana) **www.sstar.com**

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Now that you have it, what can you do with it?

You've set yourself up with a fast connection—now what are you gonna do with it? Before you do anything, make sure that you're getting what you're paying for in terms of upload and download speeds. The most accurate bandwidth meter we've stumbled upon can be found at **http://webservices.cnet.com/bandwidth**; we've found it's most accurate during off-peak hours.

So now you know that your broadband connection is a ton faster than your old dial-up account—what's all that excess speed good for? If any of the following are appealing, your new high-speed connection is definitely worth having.

▶ **Make some free (or maybe just cheap) phone calls.** Voice over IP (VoIP) hardware or software allows you to place phone calls to anywhere in the world. Creative Labs recently introduced a VoIP hardware unit, but Dialpad.com lets anyone with a fairly modern computer and a microphone make free calls to anyone with a phone. VoIP via broadband is very, very useable—plus, you get to stick it to the phone company.

▶ **Download movies straight from Hollywood to your computer.** Being ever-law-abiding citizens, we haven't tried this. But "the word on the street" is that a multitude of movies are ripe for downloading. We were told that you should check peer-to-peer filesharing services and Usenet for flicks. At least, that's what we heard (cough).

▶ **Become a Cyberathlete.** The CPL, or Cyberathlete Professional League, organizes tournaments across the country with prize pools reaching $150,000 dollars. Naturally, the low latency of a broadband connection is vital for hardcore online gamers.

If having a low ping on someone else's game server isn't good enough, host a server for your favorite game. Just be aware that hosting a dedicated server requires a high-speed synchronous connection (such as SDSL) and a spare computer. The rule of thumb for online servers is 35Kbps of upstream bandwidth and 10MHz of CPU per client. You'll also need at least 256MB of memory.

▶ **Start your own Internet radio station.** Head to Shoutcast.com for software that lets you run a server designed to stream whatever tunage you're listening to. But remember, if you happen to like music that sucks, you'll be inflicting your bad taste on a whole lotta people.

▶ **Run an FTP server.** With a spare computer, a copy of Linux, and a good book such as O'Reilly's *Running Linux*, you can be up and running in no time.

This of course begs the question: Why on earth would you want to run an FTP server? Think of it as your own personal data storage unit—one you can access anytime, from anywhere. Your stock of MP3s, movies, and mundane text files are accessible to you anytime you're at a computer. Give your friends access so they can browse through your music or video collection at will and upload their own favorites to your server.

▶ **Watch original films—some of which were made by important directors, and some of which were made by a random dude with a camcorder.** The net has delivered some film gems, including *Spirit of X-Mas*, *Troopers*, *405*, and *George Lucas in Love*. Head to ifilm.com for a look.

▶ **Expand your musical horizons.** There are millions of people out there with 23 versions of "Oops, I Did It Again," but there's also one guy with live recordings of every Phish concert. Regardless of your taste in music, there's someone out there listening to the same stuff. Finding music online isn't a matter of saving money—it's about getting access to tunes that you may not find anywhere else. And, believe it or not, *Napster* (**www.napster.com**) isn't the only way to find that music. *Gnutella* (**gnutella.wego.com**) and *CuteMX* (**www.cutemx.com**) are both worth checking out—and since they're peer-to-peer services that don't run centralized servers the way *Napster* does, they're probably not in danger of winding up in a legal imbroglio. Or check out Usenet newsgroups, a.k.a. the seedy underbelly of the Internet.

How much money can broadband save you?

We took a look at our monthly spending habits on such necessities as movies, music, long distance phone calls, and (ahem) "adult entertainment" and tallied up the amount of green we'd save every month by turning away from normal resources and using the Internet instead. Here's what we came up with:

▶ **Music:** An average music fan buys two or three CDs a month. Savings if you download MP3s from the net instead? **$30**

▶ **Movie theater:** An average moviegoer will probably hit the theater twice a month. Figure somewhere around $10 per ticket, and the average net user will save **$20** per month. Warning! If you call watching a movie on your computer "a date," you may end up saving lots *more* money due to a lack of *future* dates.

▶ **Long distance phone calls:** With voice over IP (VoIP) software or hardware, long distance calls can cost as little as 10 percent of their normal cost. If your average long distance phone bill is $40, you'll save **$36**.

▶ **Adult entertainment:** You know it's there, and you know how to find it. Depending on your libido, the Internet could save you the cost of a magazine or up to thousands of dollars every month. We'll (kindly) guess that it saves you **$10**.

Thanks to the modern miracle that is the Internet, you can save big bucks every month on entertainment costs. An average editor, such as Josh, could save around $100 a month.

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Can you optimize your connection?

You betcha. But know that these tweaks involve hacking your Registry, which can really mess up your computer if done improperly. So, do it properly—see page 48 for the lowdown on Registry safety. Know also that these tips are good only for Windows 98 (original and SE) and Millennium machines. If you're using NT4, Windows 95, or Windows 2000, check out SpeedGuide.net for details on optimizing your connection.

To make changes to your Registry, open the editing program called Regedit by going to the Start Menu, selecting Run, and typing "regedit" (without the quotes).

The MaxMTU setting gives your computer the size limit for any given piece of information the machine wants to send to the net. A lower MaxMTU setting is better for slow connections, but broadband users should be able to crank this up for a hefty performance boost.

The MaxMTU string value is usually located in HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Class\NetTrans\0001, but if you don't see it there, search for it using the Find menu. Once you've found the string value, double-click it and change it to 1500.

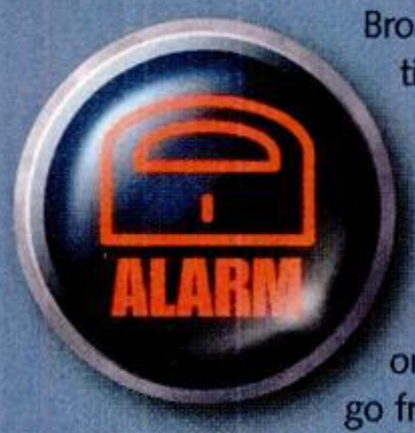
PMTUDiscovery is usually located at HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\VxD\MSTCP. If PMTUDiscovery is set to 1, your computer attempts to optimize the MTU for each individual connection, instead of using the Maximum value you just set. Find PMTUDiscovery, double-click it, and set it to 0 so it will automatically use the MaxMTU setting you set above.

DefaultTTL, located in the same subfolder as PMTUDiscovery, controls the amount of time a packet will persist before it's declared lost and resent. Again, find the value and double-click it. We recommend testing settings between 32 and 128 to find the best performance. In order to get this setting to take effect, you'll have to reboot your Windows machine after making the change.

MaxDupAcks helps reduce network traffic. It's in HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\VX\MSTCP\Parameters. Start by setting it to 2, but try different settings between 2 and 6 to find the best performance.

If you don't feel comfortable monkeying around in the Registry, several programs available for free on the net will handle all that nasty digging around for you. We were especially impressed with iSpeed (**www.hms.com**), which allows you to change the settings mentioned above, as well as some others, from a friendly GUI interface. Not only does this save you mucking about in the Registry, but it also gives you some performance tips and works out tricky math for you.

How can you protect yourself from hackers, crackers, and all-around wackos?



Broadband connections are literally changing the nature of the Internet. When you get hooked up with an always-on connection, you go from being an off-again/on-again visitor to becoming an actual part of the Internet. Equipping your machine with a default, unsecured version of Windows is like going on vacation, leaving your home unlocked, and posting a sign in the front yard that says, "Welcome, thieves, we'll be back in two weeks!" Not only do you leave your computer and the data it contains open for exploitation, but you also give bad guys an unsecured broadband box that can be used in a distributed denial of service (DDoS) attack against the web sites of their choice. We can't tell you everything about securing your Windows install, but we'll get you started on securing your connected computer.

Every day, a new way is discovered for unauthorized users to access your computer through security holes in Windows. The most important thing you can do is keep your version of Windows up-to-date. Fortunately, this is easy to do since Windows Update was introduced. Point your browser to **www.windowsupdate.com**, select Product Updates, and install all critical updates listed there. We suggest that you install the Critical Update Notification tool, which will notify you whenever a new critical update is available.

Another important security measure involves closely monitoring any file-sharing you're doing via Windows. The safest policy is to totally shut down Windows filesharing on your computer by entering the Network Control Panel and deleting File and Printer Sharing for Microsoft Networks.

If you don't want to totally disable file and printer sharing, at least lock down your shared folders. First, minimize the number of shares you have. If all you need to share is your MP3 directory and your My Documents directory, share those directories separately—don't share your entire C: drive. If you don't remember how many shares you've set up, go to Network Neighborhood, browse to your workgroup, and double-click your computer's name. This is what anyone who connects to your network will see. Remember to remove all the unnecessary shares by right-clicking the shared folders, selecting the Sharing menu, and disabling the share.

Make sure you've assigned passwords to all shared folders. Open the Sharing window for each and set passwords for the read-only and/or full-access settings, depending on what you've decided to allow. And for Pete's sake, make sure your passwords are *good* passwords. A good password contains both letters and numerals and won't be found in a dictionary. Don't be a schmegege and use your birthday, your phone number, or your mother's maiden name, because just about anyone on the planet can probably figure those out. Of course, it goes without saying that your passwords should be something that you can easily remember.

Finally, a software firewall can help insulate your computer from the harsh cruelties of the outside world. A firewall insinuates itself between the network and your computer's TCP/IP stack and has the ability to inspect and log information about incoming and outgoing packets. You can also configure a firewall that denies entry to packets based on their type, origin IP address, or domain. Additionally, most consumer firewalls have heuristics that allow them to detect suspicious behavior from remote computers.

Which firewall software do we like? For advanced users who don't mind getting their hands dirty, Norton *Personal Firewall* will set you back about $50. If you're looking to set up a firewall and forget you have it unless there's a problem, get *BlackIce Defender*. It's easy to configure and provides easy-to-understand warnings. Plus, it costs just $40.

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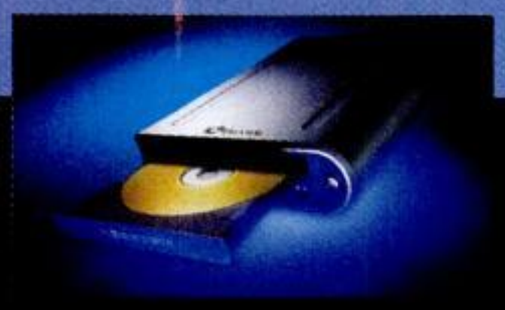
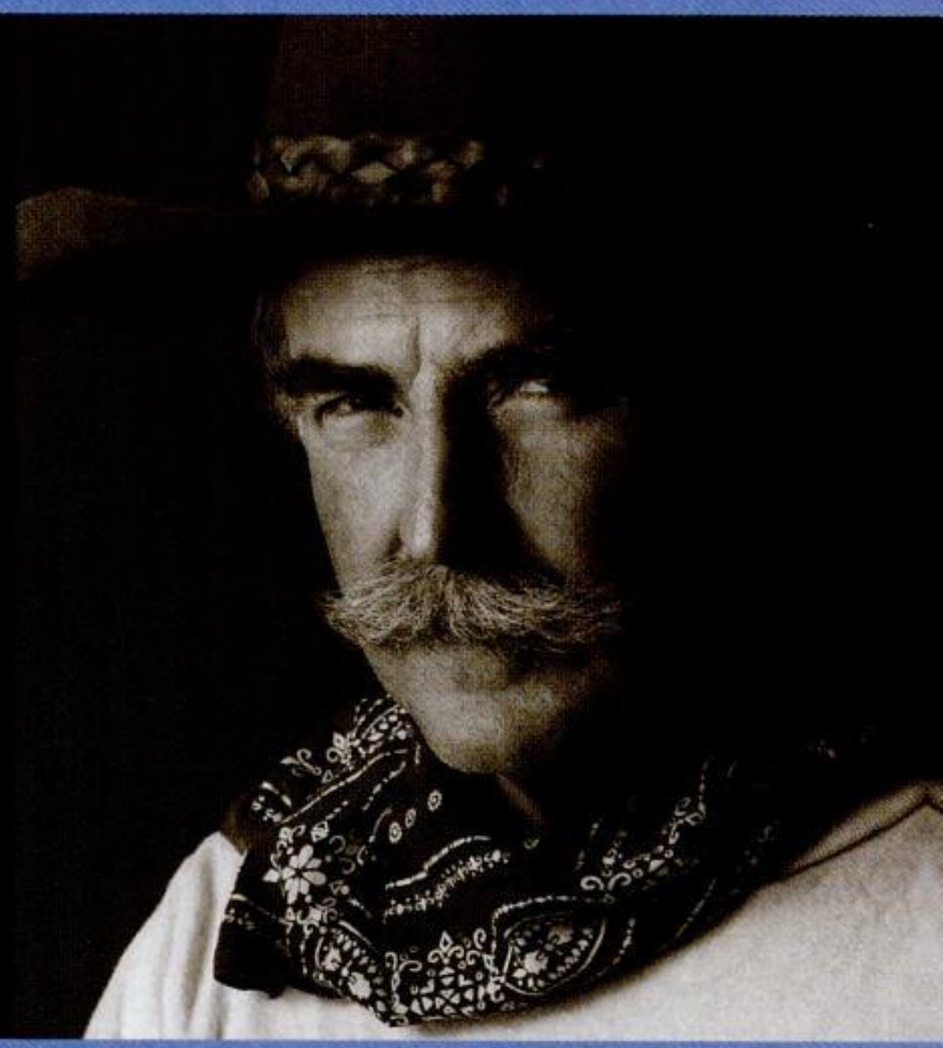


"Tell me again why I need a new Plextor drive — and smile when you say it."



Is it possible to make a product that's too good? At a recent trade show, we met a Texas rancher who bristled at the idea that it might be time to put his trustworthy Plextor® out to pasture.

"Still works just fine — best drive I ever had. Don't need a new one."

Our Drives Are Built To Last
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A Great Reason To Smile, Wouldn't You Say?
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Recognized for Reliability

PC WORLD BEST BUY — PlexWriter 12/10/32A September 2000

KICK ASS! product — PlexWriter 8/20 May 1999

PlexWriter 8/20 February 1999

WINLIST — PlexWriter 12/10/32 June 2000

MEDIA — PlexWriter 8/20 February 1999

PC WORLD WORLD CLASS — PlexWriter 8/4/32 July 2000

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Hit a roadblock that's preventing you from getting DSL or cable? Here's what you can do.

Frankly, start by picketing your phone company and cable company. If protest and civil disobedience don't help, there are some alternatives available. They're not quite as appealing as DSL or cable, but they still beat the pants of 56K modem service.

Integrated Services Digital Network (ISDN) was the *original* broadband connection. First developed in the early 1980s, ISDN allows for 64Kbps or 128Kbps synchronous connections. ISDN is available almost everywhere. It's usually priced for businesses, but check with your local phone company, because in some areas ISDN costs as little as $35 a month.

Digital satellite connections, such as DirecPC (**www.direcpc.com**), offer high-speed Internet access to anyone whose home has clear southern exposure. Currently, DirecPC offers download speeds around 400Kbps, but uploads are handled by your analog modem, limiting them to 33.6Kbps (DirecPC is rolling out a new two-way satellite service that doesn't use a modem and allows 128Kbps uploads). Unfortunately, satellites aren't good for gaming due to lag. Because the satellite orbits about 22,000 miles above the Earth's surface, it takes at least 240 ms for data to travel from the ground to the satellite and back down to the dish in your backyard. That doesn't affect web browsing or downloads, but it really puts the death in deathmatch.

For people with lots of money who live in areas not serviced by DSL or cable, there's T1. A T1 is a very reliable 1.5Mbps connection, typically delivered over an HDSL line, and is most often used by businesses, ISPs, and web hosting companies. But because of their high reliability, T1s cost serious money—monthly rates run in the thousands of dollars, not the hundreds.

Top Sites for Broadband Users

Following are sites filled with loads of resources for broadband users, and sites that really shine when accessed with a broadband connection.

Resources:

▶ **www.dslreports.com** DSL Reports is one-stop shopping for all things DSL. Whether you want purchase information or tips on tweaking, this is your site.

▶ **www.cable-modem.net** This is where you'll find straight shootin' on cable modem connections, including hardware reviews and tweaking guides.

▶ **www.speedguide.com** Speedguide offers how-tos for every sort of tweak imaginable, all designed to help you get the most from your broadband connection.

▶ **www.covad.com** Unless you get a DSL line from your telephone company, Covad most likely supplies the connection between you and your ISP. The Covad site contains a handy search tool that will tell you if there's a DSL ISP that will bring DSL service to you.

▶ **www.howthingswork.com** How Things Work isn't entirely broadband related, but it does house two excellent features explaining how xDSL and cable Internet connections work. Definitely worth checking out.

Fun sites:

▶ **www.napster.com** If you haven't heard of *Napster* by now, you really need to get out more. By inciting a peer-to-peer file-sharing revolution, *Napster* is changing the way music is made and distributed. While it's true that *Napster* will work over a dial-up connection, there's a biiiiiiig difference between waiting 30 seconds for a song to download and waiting 10 minutes.

▶ **www.ifilm.com** Budding Kubricks and Spielbergs shouldn't miss ifilm. The self-described "leading Internet resource for film fans, filmmakers, and entertainment industry professionals" hosts short films made by just about anyone. There's even an opportunity for you to cast your critical eyes and play amateur Ebert.

▶ **www.adcritic.com** If you haven't visited AdCritic before, you're missing out. It's where you'll find streaming video footage of tons of TV commercials. Watch the "Wassup" ads anytime you want!

▶ **www.newgrounds.com** Newgrounds serves as a central repository for everything made with MacroMedia Flash. **Warning:** Some of the site's content isn't appropriate for anyone under 18.

▶ **www.atomfilms.com** Like ifilm, AtomFilms hosts independent short films from filmmakers everywhere. Atomfilms' viewers review each film and the site runs a daily list of its top picks.

▶ **www.videofarm.com** VideoFarm allows holders of broadband connections to perform advanced video-editing functions over the web. For a nominal fee, VideoFarm will host your video, allow you to edit it online, and prepare it for streaming from any web site. We're not convinced that VideoFarm is better than a copy of *Premiere* paired with a FireWire card, but you can play with it for free for one month, so it's worth giving it a whirl.

▶ **www.nationalgeographic.com/congotrek** National Geographic's Congo Trek web site is a 21st-century travelogue following biologist Mike Fay's year-long trek through the jungles or Equatorial Africa. The site features regular video and audio updates as Mike progresses through the jungle.

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Case Studies

Not happy with the plastic shell that fits around your components? Here are four reviews and two how-tos.

You can go to great lengths to create the perfect PC, but a righteous rig consists of more than just the choicest hardware. Without the right case to house your precious parts, your machine's simply going to be less than dreamy. Cramming all of your fine components into a crummy little case is like dropping a Ferrari engine into a Ford Pinto.

What you need in a case depends somewhat on what your PC will be used for, but every case should accommodate an efficient cooling scheme and room for growth. And frankly, good looks don't hurt—after all, it's your system's case that most folks will see.

Cases come in a variety of shapes and sizes, but unless you're building a server, a mid-tower will probably serve your purposes. Mid-towers usually have three or more external 5.25-inch drive bays, are vertically inclined, and can house AT/ATX or WTX motherboards. Options such as removable drive bays and motherboard trays, big ol' power supplies, and screwless side panels are all worth looking for.

On the following pages, we take a look at four mid-tower ATX cases vying for the honor of housing our hallowed components. And since even the best machine can benefit from a few modifications, we also walk you through a few tricks for creating better airflow and cleaning up your wiring.

BY SCOTT TARR AND GORDON MAH UNG

Antec SX830

The SX830 is the little brother to Antec's SX1030, which received an 8 in our November 2000 issue. Despite slight differences between the two, they're virtually the same case.

The most obvious distinction—aside from the front bezel and swing-out door on the SX1030—is that the SX830 doesn't include a second removable drive tray. Instead, it annexes a second 80mm front fan slot. The SX830's lone drive bay houses up to three 3.25-inch drives and maintains the Antec tradition of offering the most easily removable drive trays we've seen. Just flip a lever and pull out the tray—it couldn't be simpler.

Donning rags similar to its bigger brother, the Antec SX830 does a damn fine job of keeping your PC's innards together.

As with the SX1030, the SX830's case construction is superb. Our baby-soft hands are always protected, since the case's sharp edges are folded over, leaving a clean, sturdy edge. And the SX830 includes the Antec 300W power supply, which can hold its own in terms of reliability and power distribution to all but the most power-hungry systems.

As for drive installation, both Antec cases we've seen use rails—you either love 'em or hate 'em, and our own staff stands divided over their benefits. But all agree that the SX830's worst trait is its lack of a removable motherboard tray.

In spite of this, Antec offers a good overall case in the SX830. It's strong, sturdy, and spacious, and we'd be more than happy to have one house our rig.

PLUSES
Solid construction
Rails

MINUSES
Unfiltered fans
No mobo tray

MAXIMUM PC VERDICT 8

$100 | Sony
www.antec-inc.com | 734.214.6580

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SP-North America Silent PC

Small cases tend to be cramped and poorly designed, but the Silent PC is neither. Though it's the smallest case in our roundup, the Silent PC's diminutive frame conceals what turns out to be a rather commodious space.

With a removable motherboard tray, two removable drive trays, and quick-release cardholders, the Silent PC is a right proper PC enclosure—with one obvious shortcoming in the power supply department. The included Q Technology Ultra Quiet 230W power supply boasts low decibel ratings in accordance with SP-North America's "Silent PC" plan, but we prefer to see at least 300W in a box.

It took us a while to locate the Silent PC's advertised removable motherboard tray. In fact, at first glance, the entire interior of the case appears to be made of just one piece of metal. But after removing both side panels and pulling on a "handle" that's cut out of the motherboard tray, we were finally able to pull the tray out. A drive tray under the power supply also pulls out completely, and is even equipped with a 60mm fan slot.

The Silent PC case has more features packed into its diminutive frame than other larger cases. Whoo, doggy!

The Silent PC's biggest drawback is a lack of cooling fans. Although additional fans might make this case less silent, the side panels are covered with sound-deadening material that would keep noise from added fans to a minimum.

We're also less than thrilled with the screw system that holds the motherboard to the tray; it requires you to use screws supplied by SP-North America. Still, these are small gripes for a case with a small footprint but lots of internal real estate.

PLUSES
- Packs a lot into small frame
- Slick removable tray
- Sound-deadening material

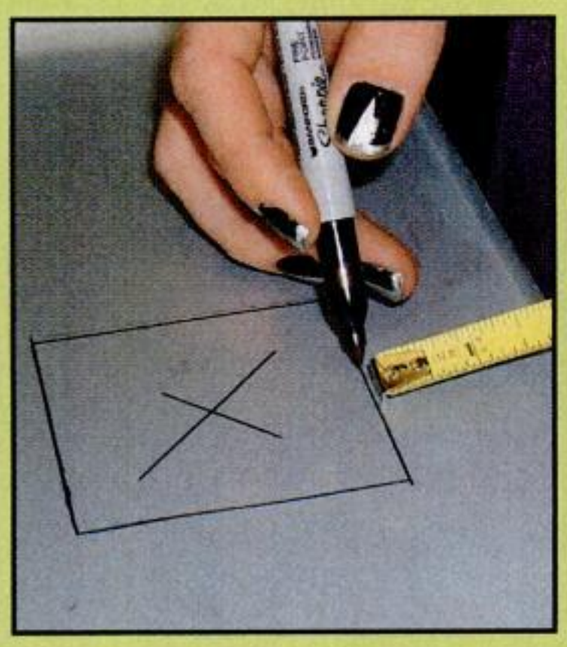
MINUSES
- No fans

MAXIMUM PC VERDICT 9

$135 | SP-North America
www.sp.com | 734.214.6580

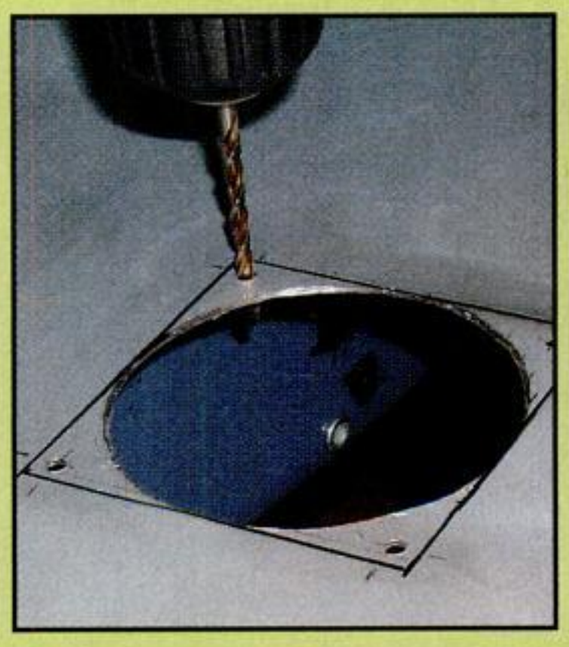
Blowholes for Dummies

Build your own blowhole and bring cooler ambient air into your case. Ahh, fresh air...



1 Determine where on your case's side panel a blowhole will maximize airflow. We're putting ours over the proc. On the interior of the side panel, draw a square to mark the fan's intended location. Marking from one corner of the square to the opposite corner will determine the square's center.

2 Before you start drilling, secure the side panel to keep it from bouncing around. With a three-inch hole saw, cut a circle into the panel in the center of the square.



3 Use a Dremel tool to remove the hole's rough edges. Position a fan over the hole and mark the spots where the fan's screws will be mounted. Drill holes for the screws.

4 Mount the fan and its protective grill on the panel with screws. The wiring from the fan must be long enough to allow the side panel to be opened and closed. Connect the wiring to a power-supply connector inside the case.

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Elan Vital T-10

Does the word "vanilla" mean anything to you? From 10 feet away, Elan Vital's T-10 looks like an ancient Dell case: blocky, bland, and booooooring. Good thing the T-10 packs some punch inside. With two removable drive bays—one above the power supply and one in the typical location—and a removable (though stout) bracing mechanism, this half-pint case has enough space to keep the case-upgrade monkey at bay. However, certain issues with the T-10's layout and design need addressing.

The most glaring annoyance is the T-10's piddly power button. No practical button, short of a Rube Goldberg creation, should involve twisting and then pushing.

The T-10 may look like it did the Time Warp back to 1995, but its strength lies in its durability.

Additionally irksome design flaws include the removable drive tray's tendency to snag on just about every nearby object when it's being installed in the case.

Elan Vital has designed a quiet cooling mechanism that employs an air duct between your system's proc and the exterior of the case. Called Whisper, it comes in either a slot- or socketed-processor package. The concept is great, but the Whisper's implementation isn't ideal. It works when set up properly, but involves assembly procedures such as cutting the unnecessarily long duct down to the proper length. Our advice? Don't opt for the Whisper option. Instead, get yourself a mega-heatsink.

The T-10 does boast a level of brawn that we didn't see in the other cases in this roundup. In fact, Elan Vital fabricated the removable brace in the T-10 in order to beef up its body. Throw in the almost indestructible front bezel and you have a fine example of a thoroughly utilitarian and totally mundane case. If you're looking for a box you can throw in the car on your way to a LAN party, the T-10 does the job. If you want a beauty that'll make your friends drool, shop elsewhere.

PLUSES
- Sturdy and strong
- Good LAN-party case

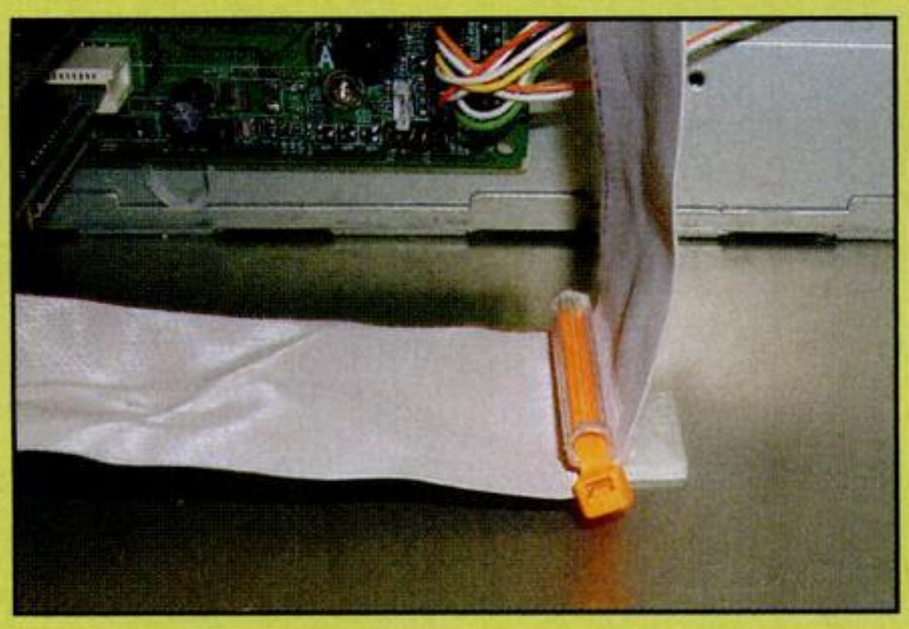
MINUSES
- Bad power button
- Chintzy removable drive bay
- Convoluted Whisper mechanism

MAXIMUM PC VERDICT 6

$95 with 300W power supply; $15 for Whisper device | Elan Vital
www.elanvital.com.tw | 408.9412070

Basic Case Housecleaning

Tired of that jangled jumble of wires choking your case? Here are a few tips to help you tidy up the mess.



1 The pen trick: Zip ties are a great way to bundle and clean up loose round wires, but the ties can crush ribbon cables. Keep Zip ties from destroying your IDE cables by cutting the casing of a ballpoint pen to the width of the cable and routing the tie through it. Then, fasten the pen to an anchor that you've glued to the case.

2 Wiring loom: Next to IDE cables, wires from your power supply contribute most to interior eyesores. Give your case a tricked-out look by wrapping unsightly wires in plastic wire loom material (available at Radio Shack) or a length of plastic tubing.

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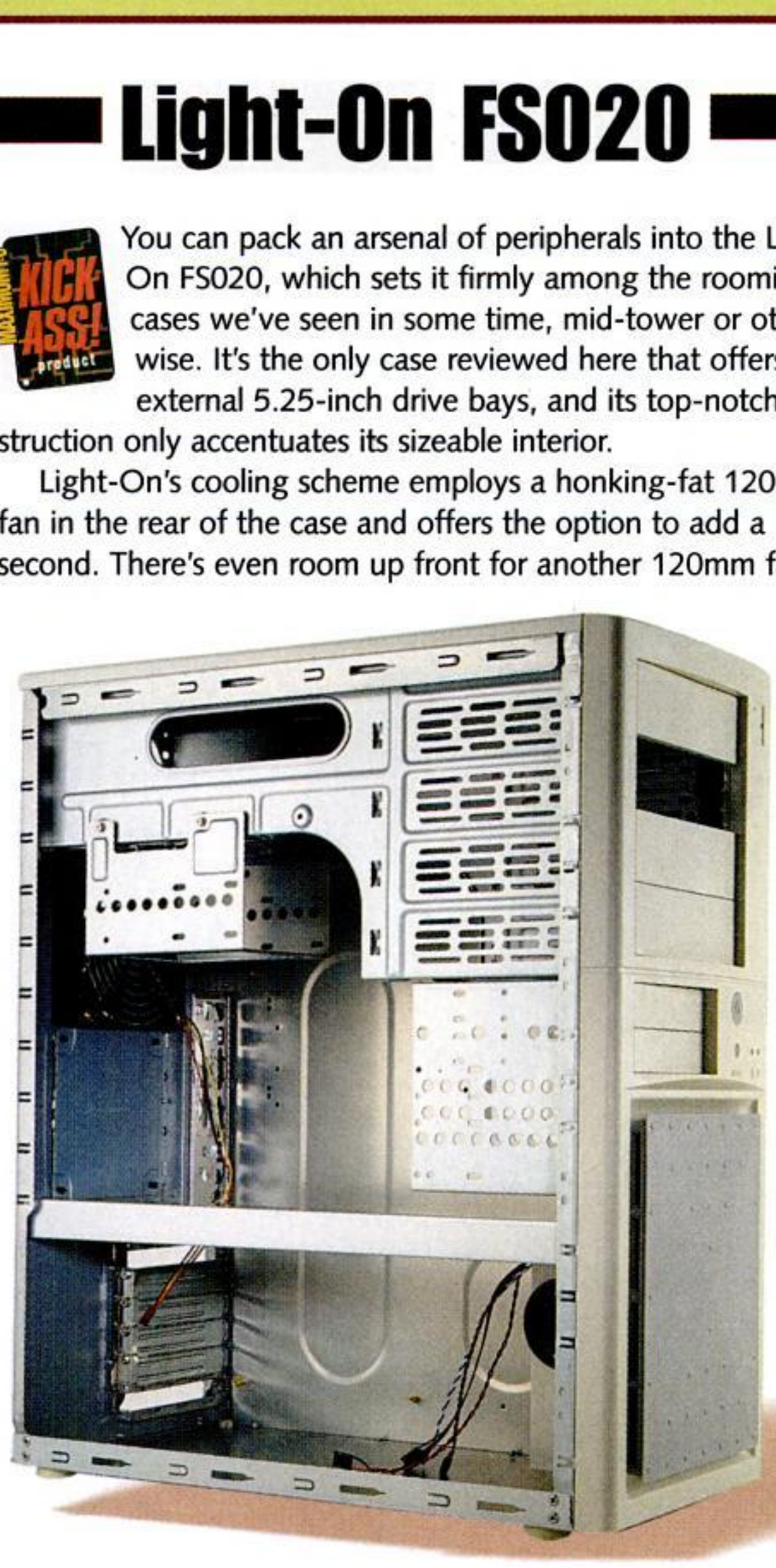
Light-On FS020

You can pack an arsenal of peripherals into the Light-On FS020, which sets it firmly among the roomiest cases we've seen in some time, mid-tower or otherwise. It's the only case reviewed here that offers four external 5.25-inch drive bays, and its top-notch construction only accentuates its sizeable interior.

Light-On's cooling scheme employs a honking-fat 120mm fan in the rear of the case and offers the option to add a second. There's even room up front for another 120mm fan—and yes, Light-On includes fluffy front-fan filters to keep out those evil crud puppies.



Packing front filters, a 120mm fan, and plenty of room, the Light-On FS020 is ready for anything.

The FS020 ships without a power supply, which at first blush appears to be a bad thing. But the truth is that most cases ship with chintzy power supplies, many of which limit future upgrades because they simply don't provide enough power. Still, for a case without a power supply, the FS020 is a little on the pricey side.

The FS020's worst trait once again raises the issue of our continuing love/hate relationship with drive rails. While Light-On makes the easiest-to-use drive rails that we've ever encountered, their functionality leaves something to be desired because the tabs that release the rails are tough to unlock from the case. Rails have their advantages, but this certainly isn't one of them.

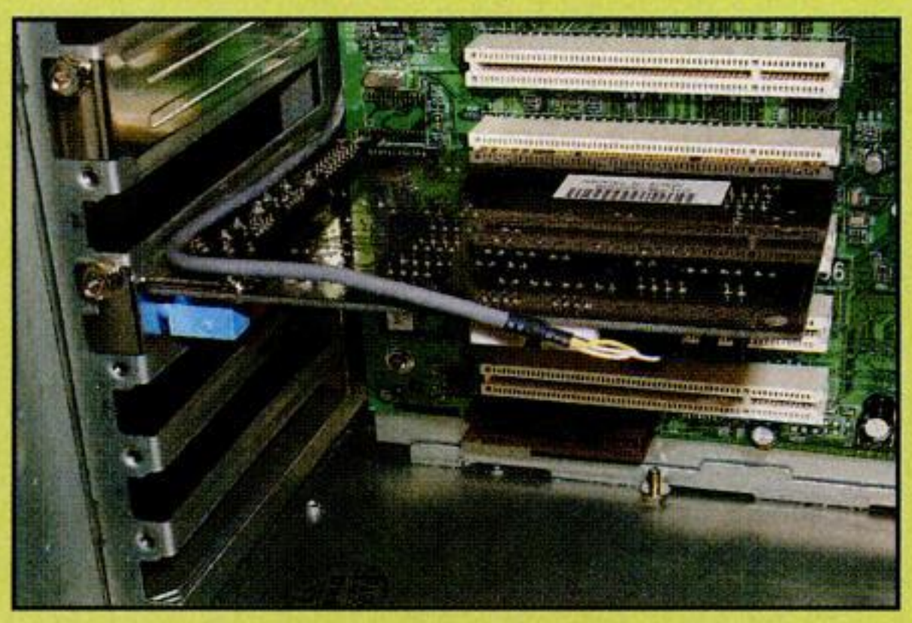
In spite of the rail issue, the FS020's overall functionality satisfies all uses but strict server environments requiring hot-swappable drive bays. The difficult drive rails notwithstanding, the FS020 simply and surely rocks our world.

PLUSES
Filters are good
120mm fan
Lots of room

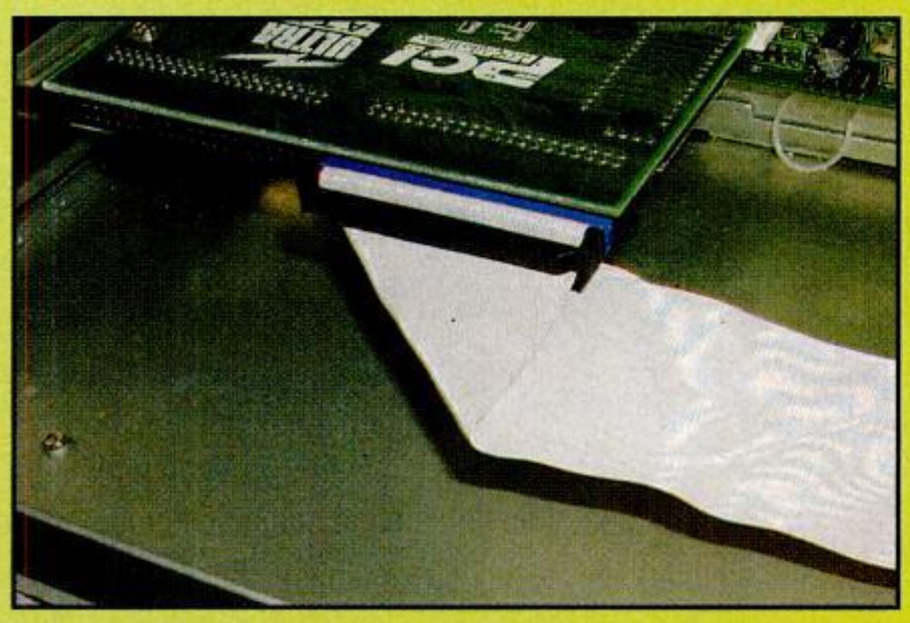
MINUSES
Rails are hard to release

MAXIMUM PC VERDICT 9

$145 | Light-On Enclosure
www.lightonenclosure.com | 909.869.6319



3 Re-route audio cable: If you think far enough ahead, you can route the audio cable going from your CD-ROM drive to your soundcard under your motherboard. Use only a quality cable that's properly shielded and of sufficient length to go the distance.



4 Tuck and fold: Square away those messy cables by gently folding your IDE cables at right angles. This also increases the airflow through your case. ATA-66/100 cables are the easiest to fold, and they hold their form, so we recommend replacing all IDE cables with the 80-pin ATA-66/100 cables.

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VERY BAD THINGS

We perform reckless PC experimentation so you don't have to!

BY JOSH NOREM

The PC is a complex machine, and when a ham-fisted upgrader starts carelessly toying with its insides, things can get ugly fast. We understand that there's a learning curve to upgrading, and we acknowledge that even hardcore hardware hackers started out as newbies—but you simply wouldn't believe the buffoonery that some of our Ask the Doctor letters describe. Some folks out there have been doing some very bad things to their computers.

So perhaps it's time to share with you some cautionary tales. In the next few pages, you'll find answers to some of the most absurd questions ever to cross a PC user's synapses, such as, "What happens when you fill a PC with insulation in order to reduce its noise output?" *These experiments are not meant to be re-created and were not conducted "just for fun."* Rather, we performed these ludicrous acts to serve as a warning to those who might carry them out in naive good faith. Don't try this at home, folks—we're doing it here so you'll know not to.

Photography by Aaron Lauer

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WHAT HAPPENS WHEN... you clean a laptop in the kitchen sink?

Since they're exposed to the elements on a daily basis, notebooks require periodic cleansing. Though spraying compressed air onto the unit to blow off offending crud is the generally accepted method of cleaning a notebook, some folks see bathing as a more thorough means of cleansing. After all, that's the only way to get to those hard-to-reach spots that the compressed air simply can't reach, such as the internal circuits of the case and the area under the keyboard, right?

RESULT

There's no denying that the laptop is much cleaner than it was before we washed it. Too bad it's also dead as a doornail. Hitting the power button yielded nary a blip or whir. Not that this is any surprise; we were pretty certain before we started that water was going to destroy the machine. But hey—we froze a videocard back in July 2000 and it worked just fine after it thawed. Still, this experiment does make us wonder if a waterproof laptop might *someday* be introduced to the public. Associate Technical Editor Scott Tarr wants one for his bathroom so he can surf the net while taking a sh…ower. In the meantime, stick with non-liquid methods for notebook cleaning.

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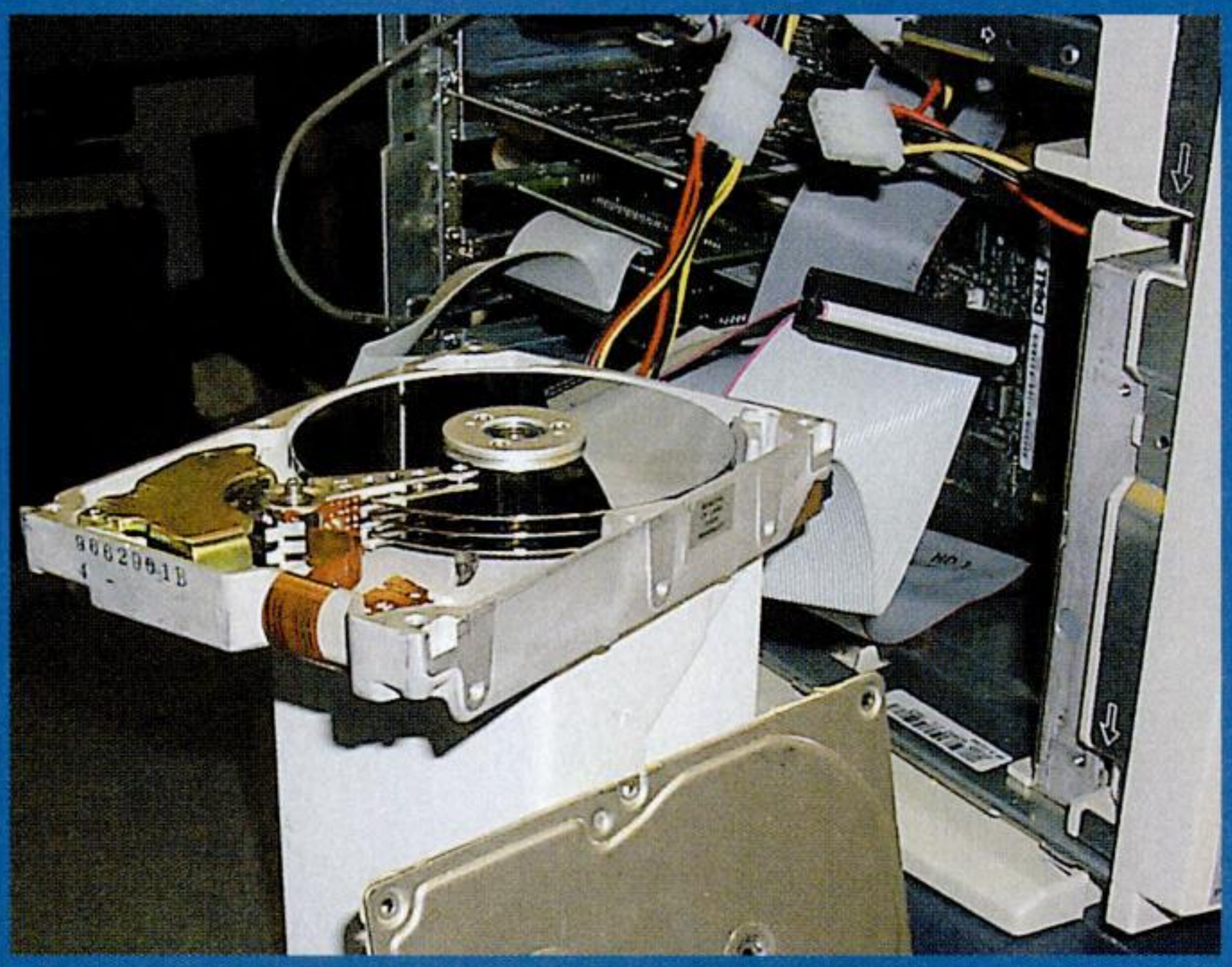
WHAT HAPPENS WHEN... you operate a hard drive without the lid on to watch the platters spin?



Many people feel that there's no better way to understand how a technology works than to observe it up-close and unfettered. Many people are also intrigued by rapidly spinning shiny objects. Pretty, pretty platters! Spinning like a Ferris wheel!

RESULT

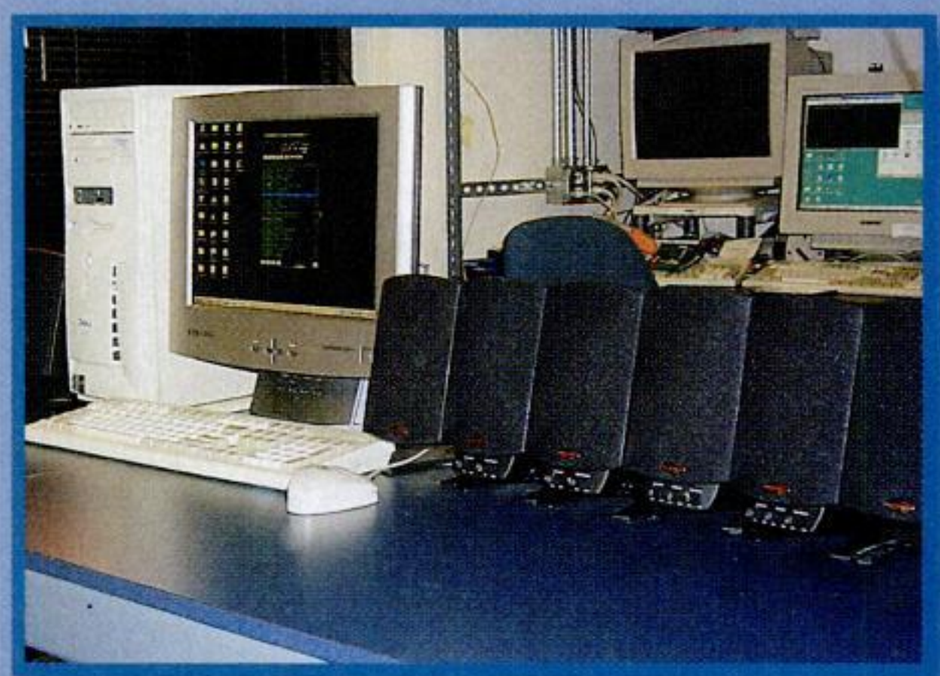
After several minutes of watching the drive's platters merrily spinning, we were greeted with an ambiguous error message saying, essentially, that our hard drive was hosed. To be honest, we didn't expect any troubles from running a hard drive in topless mode. We stand corrected.

WHAT HAPPENS WHEN... you hook up four sets of Klipsch speakers with Y jacks, in hopes of creating a 12.4 sound system (twelve satellites and four subwoofers)?

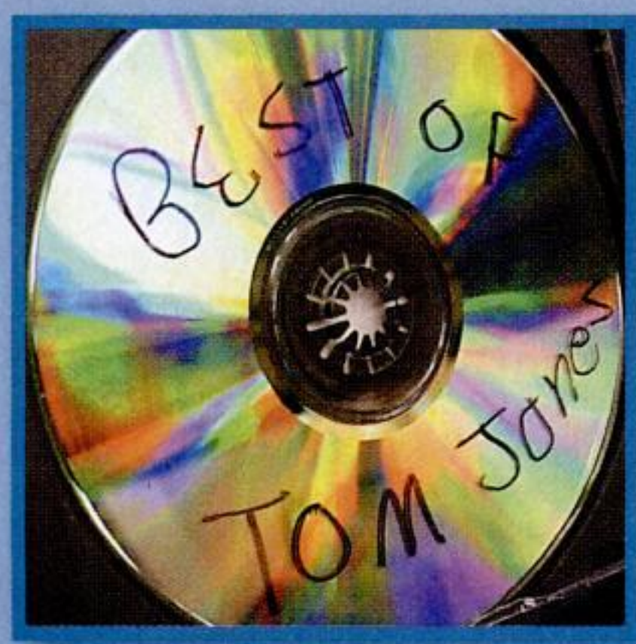
If you've ever heard the sonic fury that is the Klipsch ProMedia V.2-400, you'll understand the desire to multiply the system's sweet sound goodness fourfold. We have to admit, this is the one experiment we might have considered trying on our own.

RESULT

Sorry, what's that? We can't hear you. Burn it down? Huh? Burn down the mall? Sorry, all we hear is ringing...but we can tell you that unless you're interested in spending some quality time with the ear doctor, you really don't want to do this. In case you're wondering, this trick had no adverse affects on the hardware itself, just on our eardrums and our relationship with our neighbors.



WHAT HAPPENS WHEN... you label the wrong side of a CD-R disc?

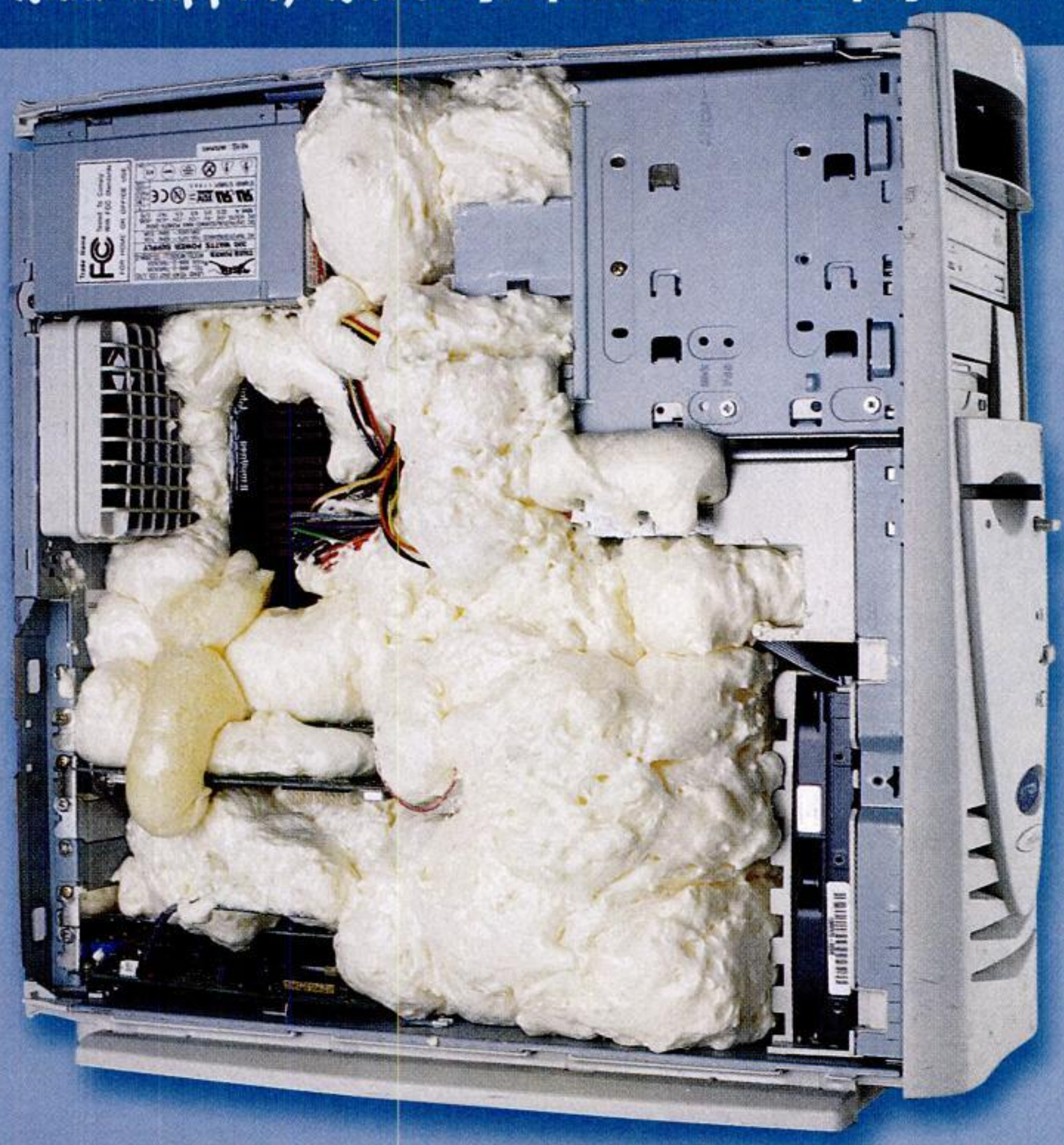


WORM media (write once, read many) has a protective layer on its underside that insulates the precious data from your greasy fingers, scratches, and general abuse. We assume that it's also there because it's ridiculously easy to label the wrong side of a CD-R—if you happen to be paying no attention whatsoever to what you're doing.

RESULT

Turns out that this is an incredibly effective method of transforming music of any genre into a rap compilation. Our *Best of Tom Jones* CD sounded just fine until the CD-ROM drive's laser tried to read a section of the CD covered in ink. That's when Tom Jones turned into Jam Master Jay, jumping, popping, and skipping like the background music for a breakdancing contest. This was cool for a minute or two, but had it been a CD we were especially attached to, the wiggedy-wiggedy-wackness would have gotten to us, for sure.

WHAT HAPPENS WHEN... you pack a case with spray-on insulation to keep it quiet?



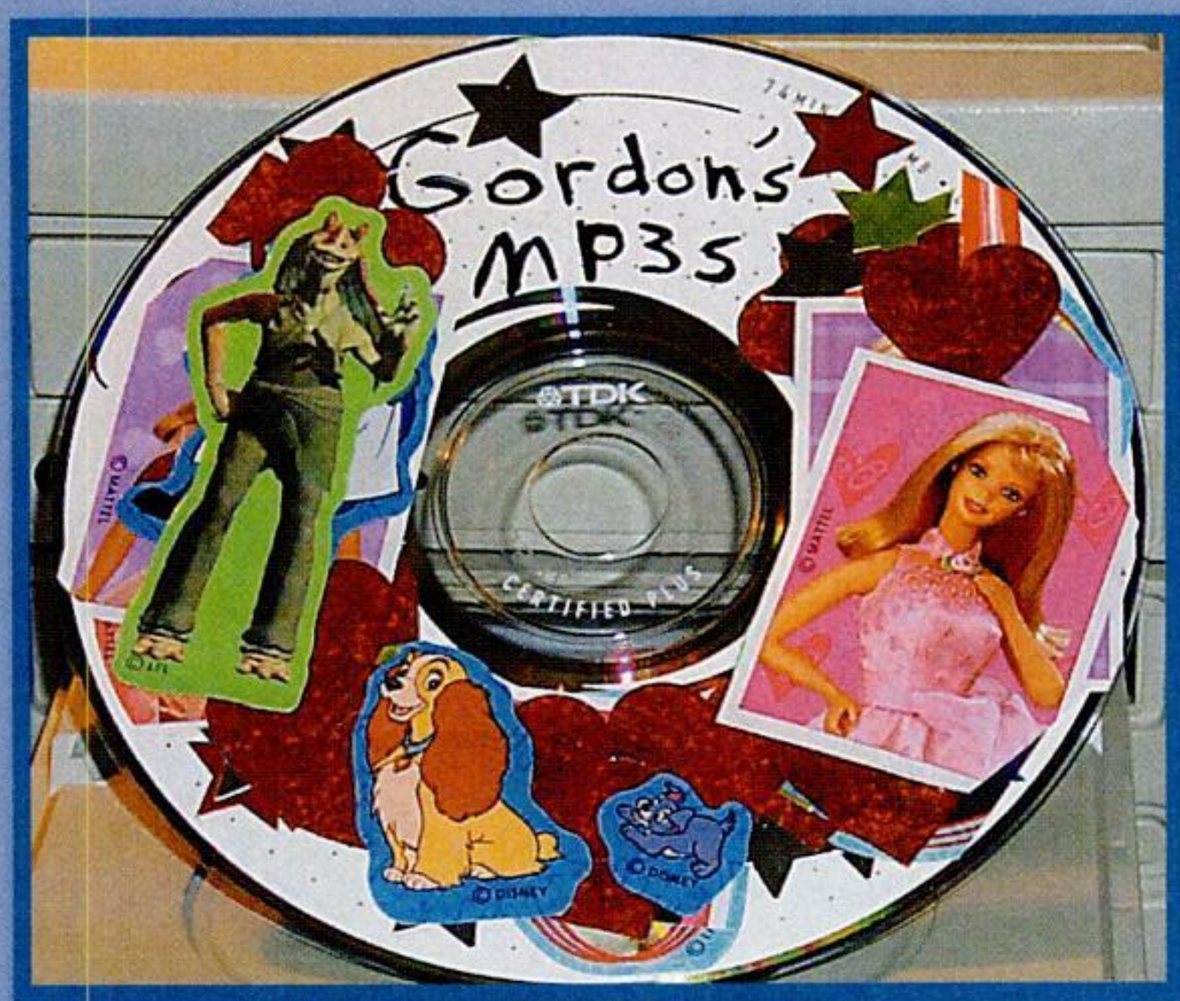
There's nothing worse than a noisy PC, other than jock itch and possibly a case of the gout. Buying quieter components is one solution to this problem, but a particular brand of twisted logic says that insulation will do the trick, as well. After all, it works for houses, doesn't it?

RESULT

Did the spray-on, expand-to-fit insulation make our PC—a P-II 400 from Micron—quieter? Yes, in a way, since the machine has been rendered completely inoperable. In fact, from that perspective, quieting your PC with insulation is an outstanding idea—PCs that exhibit absolutely no activity when you hit the power button are arguably the quietest machines to be found anywhere.

WHAT HAPPENS WHEN... you decorate a CD-R with stickers instead of a single label?

As members of an office in which dozens of CD-Rs are created regularly, we understand the need for a labeling system that easily distinguishes one person's media from another's. We also understand that sometimes people feel creativity beyond what a black media pen will allow them to express. Thus, it seems perfectly reasonable that someone might think that decorating a CD-R with dime-store Barbie stickers is an effective means of letting his inner *artiste* loose.



RESULT

Stick with the marking pen, Michelangelo.

Stickers and media moving at 10,000rpm just don't mix. As soon as our sticker-laden disc started to spin in the drive, massive vibrations began emanating through the workbench that the drive was resting on. "Earthquake?" we wondered. "S-sonic bbboom? Wwwwhhhaaatttt iiiiiissss ttttttthh-haaaaaaaattttttttt?" We were able to reach the drive—which sounded like a cross between a lawnmower and an 18-wheeler—before it shook itself off the bench. Needless to say, this particular piece of media has been retired. ✹

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REGISTRY FACTS & HACKS

By Lenny Bailes

BEND WINDOWS TO YOUR WILL WITH THESE QUICK TRICKS.

Beneath your familiar Windows desktop, there lurks a world that few have seen and fewer have conquered.

It is... the Registry.

A humongous database of system configuration settings, the Registry contains the hardware defaults, device listings, display settings, desktop configurations, font information, file associations, and user profiles for the Windows operating system. This massive store of information is contained within two binary files in your WINDOWS directory, SYSTEM.DAT and USER.DAT. (USER.DAT is actually a subset of SYSTEM.DAT.)

For many, the Registry is an arcane mystery that's best left undisturbed—and in some cases, that's a wise idea, since the latest Microsoft OSes allow you to configure aspects of your system that were once only accessible via the Registry. But in other cases, hacking the Registry exposes an abundance of appearance- and performance-enhancing options. With a few nips and tucks, you can create your own pop-up menus, control program-startup defaults, and fine-tune your system performance by tweaking network settings, memory management, and modem performance.

Of course, Registry hacking can cause some problems, not the least of which is rendering your machine unable to boot. But don't let this dissuade you—you'll be safe if you remember a few simple rules. First: Make a backup copy of your working Registry before making any changes (we tell you how on the next page). Second: Remember that any changes you make in your Registry will take effect immediately. Third: Some tricks—including all of those listed on the following pages—will only work on OSes based on Windows 95 (i.e., Windows 98 and ME). If your OS is of the Windows NT or 2000 ilk, these little tweaks could royally bork your system. Use common sense, and don't fool with anything you don't understand. The Registry is not a good place to experiment or to summarily delete things you don't recognize and therefore figure you don't need.

Hacking the Registry is done through the Regedit editor, which you can access by clicking Start>Run, entering REGEDIT, and clicking OK. You'll see six keys displayed in the REGEDIT window's left-hand pane; each of them opens a set of subkeys and data values that are editable in the window's right-hand pane. On the following pages, you'll find a few fine examples of Registry hacks. Go ahead, give 'em a

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whirl—but not before you follow these simple instructions for creating that all-important backup copy.

Windows 98 users: The operating system automatically backs up the Registry once a day, storing five copies in the WINDOWS\SYSBCKUP directory. (These are packed into Cabinet files labeled RB000.CAB, RB001.CAB, and so on.) If something goes wrong, you can restore any of the backed-up versions by

(a) booting to a real DOS prompt (choose Restart in MS-DOS Mode from the Start Menu, or hold down F8 at boot time and pick Safe Command Prompt from the Windows Startup Menu), then

(b) entering the command SCANREG at the C:\ prompt. Click the Start button on the first screen; click the View Backups button on the second screen. You'll be able to scroll through the list of available backups by date and choose the one you want to restore.

Be careful about using this genie too many times in succession; each time you restore an old Registry, Windows overwrites the oldest version with the one you're replacing. If you do this five times in a row, you'll have nothing left but copies of the bad version you're replacing.

Windows Millennium users: You can return to a previous version of the Registry (and refresh other system files) using the System Restore feature located in the Accessories>System Tools folder. If the Registry is so damaged that it prevents booting to the Windows interface, you'll need to boot to a DOS prompt with an emergency floppy boot disk, then log on to the C:\ drive and run SCANREG (as described in the section above for Win98 users) to restore a backup copy.

Windows 95 users: Your OS doesn't have a SCANREG program. It keeps a single backup in the WINDOWS directory, but that copy is usually worthless because it's made *after* your Registry goes bad. (Don't ask us to explain the logic in this.) The good news is that you can back up the Registry manually from within the Windows interface. Just open Explorer, go to the WINDOWS directory, and drag copies of the two binary files, SYSTEM.DAT and USER.DAT, to a backup directory. If worst comes to worst, you can boot to a DOS prompt and issue the following commands to restore your backup copy of the Registry:

```
C:
CD \Windows
ATTRIB -R -H -S *.DAT
COPY C:\Backups\*.DAT
```

(where Backups is the name of the folder in which you stored the good binary Registry files).

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CREATE CUSTOM SOUND EVENTS FOR WINDOWS APPLICATIONS

In the event that you're interested in hearing a particular bell, whistle, or Adam Sandler voice every time you open a Word document or minimize an Excel window...

1. In Regedit, go to HKEY_CURRENT_USER\ AppEvents\Schemes\Apps.Right-click the Apps folder and create a new Key. Give it the same name as the application for which you want to create sound events, e.g., Notepad.

2. Right-click the folder you just named and create a new key. Give it the name of the action for which you want a sound event to occur, e.g., Minimize. (For a list of predefined events that can be accompanied by sounds, look in the .Default subkey. Options include: Open, Close, and MenuPopup.)

3. Right-click the folder named for the action and create a key named .Current (include the period).

4. In the right-hand windowpane, you'll see a Default value. Double-click it; in the dialog box that appears, enter the location of a .WAV file on your hard disk (e.g., C:\windows\media\ding.wav).

Note: In this case, size does matter—if the .WAV file you point to is too large, the hack won't work.

CHANGE THE LOCATION OF YOUR DESKTOP OR MY DOCUMENTS FOLDERS

If you have more than one hard drive and want to relocate either My Documents or the Desktop to someplace other than your C:\ drive, give this quick trick a turn:

1. Create new My Documents and Desktop directories on the second hard drive and copy the contents of the old directories to the new ones.

2. Fire up Regedit and go to HKEY_CURRENT_USER\ Software\Microsoft\Windows\ CurrentVersion\ Explorer\User Shell Folders\.

3. To change the My Documents directory, double-click on the string called Personal and change the value of that string to the path of your new My Documents directory (e.g., D:\My Documents).

4. To relocate your Desktop, create a new string and call it Desktop. Change the value of that string to the new location of your Desktop folder (e.g., D:\Desktop).

5. Reboot to enact the changes.

ADD A RIGHT-CLICK OPTION TO AUTOMATICALLY PRINT THE DIRECTORY CONTENTS OF ANY FOLDER

1. In Regedit, go to HKEY_CLASSES_ROOT\Folder\Shell. Right-click the Shell menu and create a new key called PrintDir.

2. Select PrintDir and right-click again; create a new key called Command.

3. Select Command, then double-click the Default value showing in the right-hand windowpane. The Edit String dialog box will appear. Type PT.BAT and click OK.

4. Open *Notepad* and type the following:

```
@echo off
dir %1 >test.fil
notepad /p test.fil
echo on
```

5. Save the *Notepad* file in your \Windows directory as PT.BAT.

6. Open Windows Explorer. Find the PT. BAT file in the \Windows directory and right-click it. Choose Properties and go to the Program tab. From the Run drop-down menu, choose Minimized. Check Close in the Exit box. Click Apply, then close the window.

GET A FACTORY-FRESH REGISTRY

If you're having unspecified Windows Registry problems in Windows 95 or 98, you can reset many of the basic configuration options to their original defaults by merging the original Registry with the current version. Have your Windows Product ID handy and:

1. Boot to a real DOS prompt (hold down F8 while booting the machine and choose the Command Prompt-only option from the Windows 98 Startup Menu).

2. Issue the following commands at the C:\ prompt:

```
CD \
ATTRIB -R -H -S SYSTEM.1ST
SMARTDRV
REGEDIT /L: C:\SYSTEM.1ST /E MY.REG
REGEDIT MY.REG
```

3. Reboot your computer. You may be prompted to enter your Windows Product ID, and the final Windows setup phase will be repeated. You won't lose any information about previously installed applications, network configuration, etc., but all of the basic OS settings will be restored to their factory defaults.

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INCREASING YOUR MODEM TIMEOUT INTERVAL

If your modem times out and disconnects during long file transfers or while dealing with web pages that take a long time to load, try increasing its timeout period.

1. In Regedit, go to KEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Class\Modem\XXXX\Settings, where XXXX is the numbered listing for your modem.

2. Double-click the Inactivity Timeout number and increase its value to the number of minutes you want to set as the modem's timeout period.

NEVER SEE "PLEASE INSERT WINDOWS 9X CD" AGAIN

If your copy of Windows was installed from a CD, Windows will always look to your CD-ROM drive (e.g., D:\Win98) when it needs anything from the CAB files—unless you change a few Registry keys.

1. Copy the contents of the Win98 folder on your Windows 98 installation CD to a directory on your hard drive.

2. Open the HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Setup\Key.

3. Open the string called SourcePath. Change the value of the SourcePath key to match the new path of your CAB files.

4. Reboot to enact the changes.

PREVENT USERS FROM USING A BLANK PASSWORD TO LOG ONTO YOUR WINDOWS MACHINE

This is a good way to keep people from accessing your password-protected apps and goodies.

1. In Regedit, go to HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\Network. Right-click the Network folder and add a new Binary Value. Name it MinPwdLen.

2. Double-click MinPwdLen; enter a number equal to the minimum number of characters you want user passwords to be (e.g., 08).

Note: If your Windows machine already recognizes users that are assigned a blank password, you'll need to delete those users or change their passwords in order for the new Registry setting to affect them.

REGCLEAN YOUR WAY OUT OF TROUBLE

If you want to scour your Registry clean without the drastic measures, try Regclean.exe. Regclean digs through your Registry and removes corrupted, unnecessary, and outdated Registry keys. While the effects of this may not be immediately obvious, it can drastically improve load times for both the OS and individual applications. You can find Regclean on the Maximum CD on or Microsoft's web site.

CONTROL THE FLY-OUT START MENU

Usually, moving your mouse over the Start Menu>Programs folder causes an automatic cascade of every submenu in the folder. Here's how you can keep the submenus from opening until you click on them:

1. In Regedit, go to the HKEY_CURRENT_USER\Control Panel\Desktop. Right-click the Desktop folder and create a new String Value. Name it MenuShowDelay.

2. Double-click the new string; an Edit String dialog box will appear. Enter the value 65534 and click OK.

3. Go to the Start Menu and choose Log Off. You'll be bounced back to Windows' login screen. After you log back in, the change should take effect.

Many Windows 98 users dislike the way the OS's Start menu adds scroll buttons to the top and bottom of a menu instead of displaying the names of all the sub-menus within it. To get rid of the scroll buttons and force the names of all submenus to be displayed:

1. Go to HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer.

2. Right-click the Explorer menu and create a new key. Name it Advanced.

3. Right-click the Advanced key and create a new String Value. Call it StartMenuScrollPrograms.

4. Double-click StartMenuScrollPrograms. In the dialog box that appears, enter a value of False.

5. Log off of Windows via the Start menu and log back in. ●

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#%_!

"UNDO"

The only four-letter word you'll use around

YOUR COMPUTER

(^*%

/"{!

*?#@

Immediately undo PC problems with GoBack™

Computing has never been trouble-free. You accidentally over-write or delete a file, your computer crashes for no apparent reason, or new software wreaks havoc on your system.

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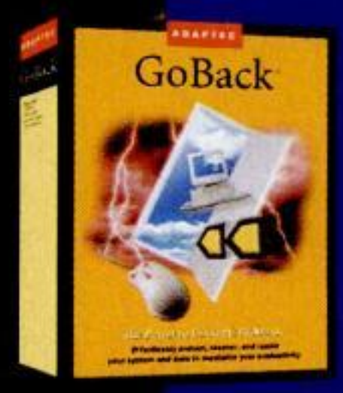

Let's face it — you're human and you make mistakes. But computing without Go Back shouldn't be one of them.

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Tracking the Wily Data Packet

The ins and outs of Internet protocol

The Internet is comprised of a massive number of computers, servers, and other devices that all speak a common language. That language, called TCP/IP, allows computers on the net to talk to one another regardless of the processor they use or the OS they run. We'll show you how TCP/IP enables communication between disparate devices that are continents apart. But before we dig in, you'll need a quick course on data transfer via the Internet.

Suppose you buy your Aunt Sally a nifty vase for her birthday. Aunt Sally lives in Punxatawnee, and you live thousands of miles away in Podunk. You don't just slap a stamp on the vase and drop it in the nearest mailbox, do you? Of course not. If you did, the cheerful lads and lasses at the U.S. Postal Service would ensure (inadvertently, of course) that the vase was in thousands of little pieces before it arrived at Aunt Sally's. So you carefully pack and wrap the vase.

Before data is released from your computer to the net, software on your machine packages your data in much the same way. The software that handles that data packaging is called the Transport Control Protocol/Internet Protocol (TCP/IP), or "the stack" for short. It's called the stack because the software is made up of several layers stacked on top of one another. The data leaving your computer is like your Aunt Sally's vase—as it passes through each layer of the stack, it's "wrapped" with information that helps it on its journey across the net.

To improve the reliability of data flow—that is, to improve the chance that data will leave your computer and arrive safely at its destination—large files sent via TCP/IP are broken into and sent as small pieces, called packets. This would be like smashing Aunt Sally's vase, sending each piece in a separate envelope, and including a note in each envelope that explains exactly how to put the vase together again. Granted, this probably wouldn't be desirable in real life, but on the net it allows for more reliable connections and faster transfers.

THE APPLICATION LAYER (OR GIFT WRAPPING)

When sending Aunt Sally's vase, you box it up and wrap it in some sort of festive paper. That way, as soon as Aunt Sally opens the shipping box, she will know that it's a gift. The Application Layer performs the same function. When a packet passes through the Application Layer, information, a.k.a. the header, is added to the front of the packet. The header attached to the packet by the Application Layer contains a description of the packet's contents. This gives the receiving computer a basic idea of what to do with the data.

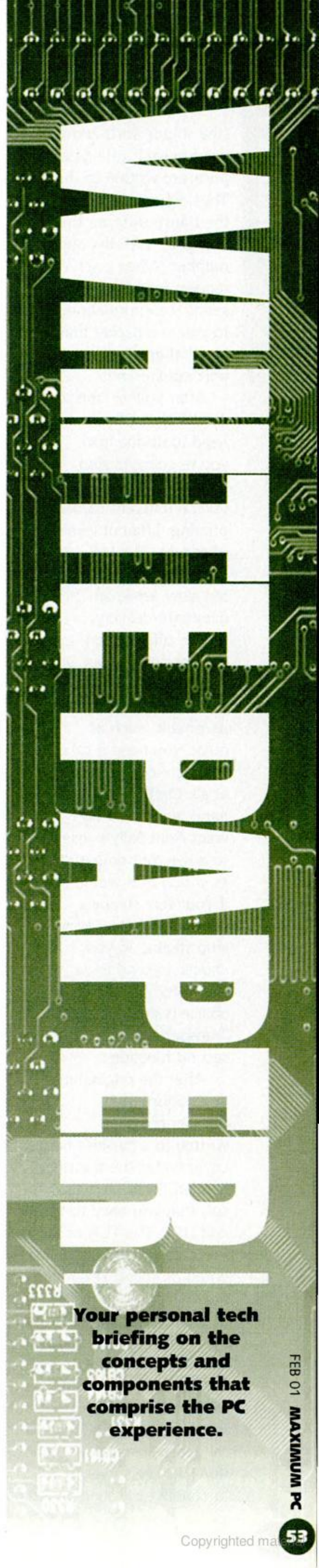
There are different protocols for different types of data that pass through the Application Layer. One of the most common is Hyper Text Transfer Protocol, or HTTP. HTTP is the language that all web-aware software speaks, regardless of platform. If HTTP sounds familiar to you, it should—it's the same http:// that your browser inserts at the beginning of most URLs you type into your web browser. So, if you're trying to browse the *Maximum PC* web site at **www.maximumpc.com**, your web browser tells the Application Layer that it wants to open up an HTTP connection to the web server that resides at **www.maximumpc.com**. The Application Layer then passes that information on to the Transport Layer.

THE TRANSPORT LAYER (OR GIFT TAG)

Once Aunt Sally's vase is wrapped in pretty pink paper, you label it with a matching card so it doesn't get mixed up with any other gifts that Aunt Sally receives. (At this point, your data would already be broken up into many separate packets, but we're not going to break Sally's vase). When Aunt Sally opens the package, she'll know that the gift inside is for her, not anyone else in her household. That's the same thing the Transport Layer does to every packet that crosses its path.

The Transport Layer is the real workhorse of TCP/IP. When an application accesses the network, it's assigned a port. Ports are holes in the Transport Layer that are used to sort incoming packets. TCP/IP provides around 65,000 ports, so you don't have to worry about running out of them, but you do need to know that the first 1,024 ports are reserved for certain specific functions—for example, web servers use port 80 to listen for HTTP requests.

Any time you open a new browser window, it is assigned a unique port number above 1,024. To ensure that data destined for one application isn't inadvertently sent to another, port numbers identify the application that generated a packet



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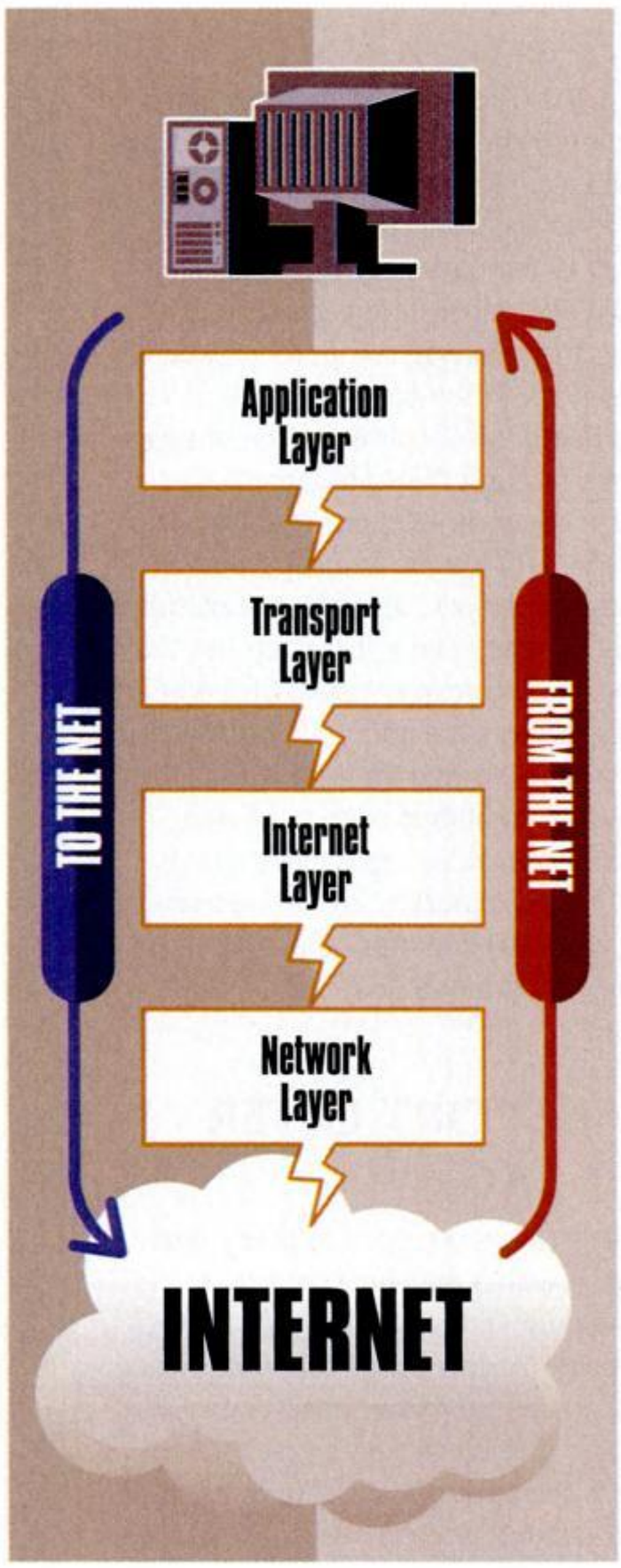
(the source port) and the application that will receive it (the destination port). Both ports are written to the packet's header. Thus, when an application sends data to the transport layer, the packets are "tagged" with the application's port number. When a server answers your request for data, it sends the information to you in a packet that has that application's port number in it.

After you've labeled Aunt Sally's gift, you need to decide how you're going to ship it to her. There are several different carriers offering different levels of service. The U.S. Postal Service is cheap but slow, while an overnight delivery service offers much quicker delivery but is more expensive. When you ship something perishable, such as meat, you need it to get there quickly or not at all. On the other hand, you definitely want Aunt Sally's vase to arrive, but time isn't as critical as it would be if you were shipping her a box of New York strip steaks. So you choose to send it via the USPS. Making that choice is similar to the Transport Layer's second function.



After the originating application's port number has been written to a packet's header, the Transport Layer writes the transfer protocol into the header. There are two main transfer protocols that you need to be aware of: TCP and UDP. The TCP, or Transport Control Protocol, is referred to as a connection-oriented protocol. This means it will establish a virtual connection, which serves as a sort of data pipe, before any data is transferred. Your PC sends out a Synchronization (Syn) packet that tells the server the specifics of the connection it wants to create, such as the specific packet size (MSS) and the number of packets that will be sent before the receiver sends an acknowledgement (RWIN). The server to which you're trying to connect will send an Acknowledgement (Ack), either accepting the MSS and RWIN or proposing new values. After your PC and the server work out the connection's details, your PC finishes with a handshake by sending a Synchronization Acknowledgement (Syn Ack) telling the server you're ready to exchange data.

Once the pipe is established, TCP breaks the data into packets that will fit in the MSS and numbers them sequentially. This allows the receiving machine to reconstitute the data easily even if the individual packets arrive out of order—which is a common occurrence on a network as large as the Internet. If TCP detects errors within any packet, it will request that the server resend that packet. The error-correction mechanism and the ability to reorder packets that are received out of order makes TCP perfect for transferring things such as files, web pages, or static images.

User Datagram Protocol (UDP) is the other major protocol used in the Transport Layer. UDP doesn't establish a connection before sending data—it doesn't care whether the receiving computer is listening or not. Unlike TCP, the receiver doesn't even acknowledge the receipt of the packets—which explains UDP's billing as a "connectionless" protocol. UDP *does* offer the ability to detect corrupt data, but, unlike TCP, the UDP receiver will simply ignore a corrupt packet and discard the data it contains.

UDP could be compared to an overnight delivery service that throws out any packages that miss their delivery time. Does UDP sound worthless? It isn't. TCP offers a lot of reliability, but that reliability comes at a price. Establishing a connection takes time and creates overhead that causes the effective bandwidth of a data transfer to go down (effective bandwidth is the actual amount of data that you can transfer in a given amount of time). UDP doesn't have the overhead that TCP does, so the effective bandwidth of a transfer is higher, as long as there are no errors on the network. Across a stable network, UDP offers better transfer rates than TCP, so for some applications (such as streaming audio and video, or multiplayer gaming), UDP makes sense. TCP is the preferred protocol for transferring files (such as a web page or zip file) from one computer to another because you need to know that the data has reached the server without any errors.

The Transport Layer establishes a connection, or pipe, between your computer and the server, which is used to transfer each file that makes up the web page you want to visit. At this point, your packet still doesn't know where it's going or where it's from. Never fear, though—that information is added in the next layer, the Internet Layer.

THE INTERNET LAYER (OR BOX ADDRESS)

Once you've decided how you're shipping Aunt Sally's vase, you need to put her address and your return address on the box. This tells the mailman where the package goes and to where it should be returned if there's a problem. The Internet Layer does the very same thing to your packets.

In the Internet Layer, the stack adds an Internet Protocol (IP) address to the header of every packet that's sent out onto the network. An IP address is a set of four numbers separated by periods. Each device, or node, on a network has to have an IP address. The IP header contains the IP of a packet's source (your PC) and the IP of a packet's destination (the server you're trying to reach). Routers use IP addresses to send packets between nodes on different parts of the network.

The Internet Layer can also perform Network Address Translation (NAT). NAT is used to hide nodes by replacing their individual IP addresses with the external IP address of the NAT server when packets are sent to the Internet. A NAT server will typically have two network interfaces—one connected to the internal network (the nodes that are being hidden), and one connected to the external network, which is usually the Internet. When the NAT server receives a packet from the internal network, the original source IP address and the details of the connection request are stored in a NAT table on the server. When a reply comes back from the Internet, the NAT server compares the return with the data in the NAT table. If the return matches the

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original request, the NAT server will strip its IP address from the packet and add the IP address of the PC that made the original request. The server then passes the packet on to the internal network. If the NAT server can't find a match, it trashes the incoming packet. This helps protect your internal network by deflecting any unsolicited packets. This means that other computers aren't able to contact your computer unless you contact the remote machine first.

The Internet Layer writes both the packet's destination and origin to the header, allowing the network hardware of the Internet to send the packet to its destination and bring a response back from the destination machine. After it's done its duty, the Internet Layer passes the packet down to the final layer, the Network Layer.

THE NETWORK LAYER (OR FRIENDLY MAIL CARRIER)

Your package is wrapped, addressed, and ready to go—it's time to meet the mail carrier. Well, actually, it's time to put your package in the mail carrier's hands; from then on, Aunt Sally's vase is his or her problem. The Network Layer serves the same purpose—it takes the packet and dumps it onto the network, where it finds its way to its destination.

The Network Layer provides an actual physical connection to a network. It consists of your Network Interface Card (NIC), the device drivers for the NIC, the NIC's cable, and all the physical hardware that makes up the network you're connected to. The Network Layer uses Medium Access Control (MAC) addresses—unique 12-digit addresses that must be assigned to every piece of hardware connected to the network—to send packets between nodes on the same logical and physical network. It can detect data corruption, but it ignores any bad packets it receives. The Network Layer isn't concerned with bad data, because it assumes that the Transport Layer will take care of those details.

Once your packet has been totally wrapped up by the three preceding layers, its header should bear all the details about what it contains, where it's going, and where it's from, ready to be released into the wilds of the Internet. By descending through the layers of the stack, your browser's request for a web page has had a set of rules applied to it that tell the network what it should do with the packet and its contents.

MAXIMUM WEB BROWSING

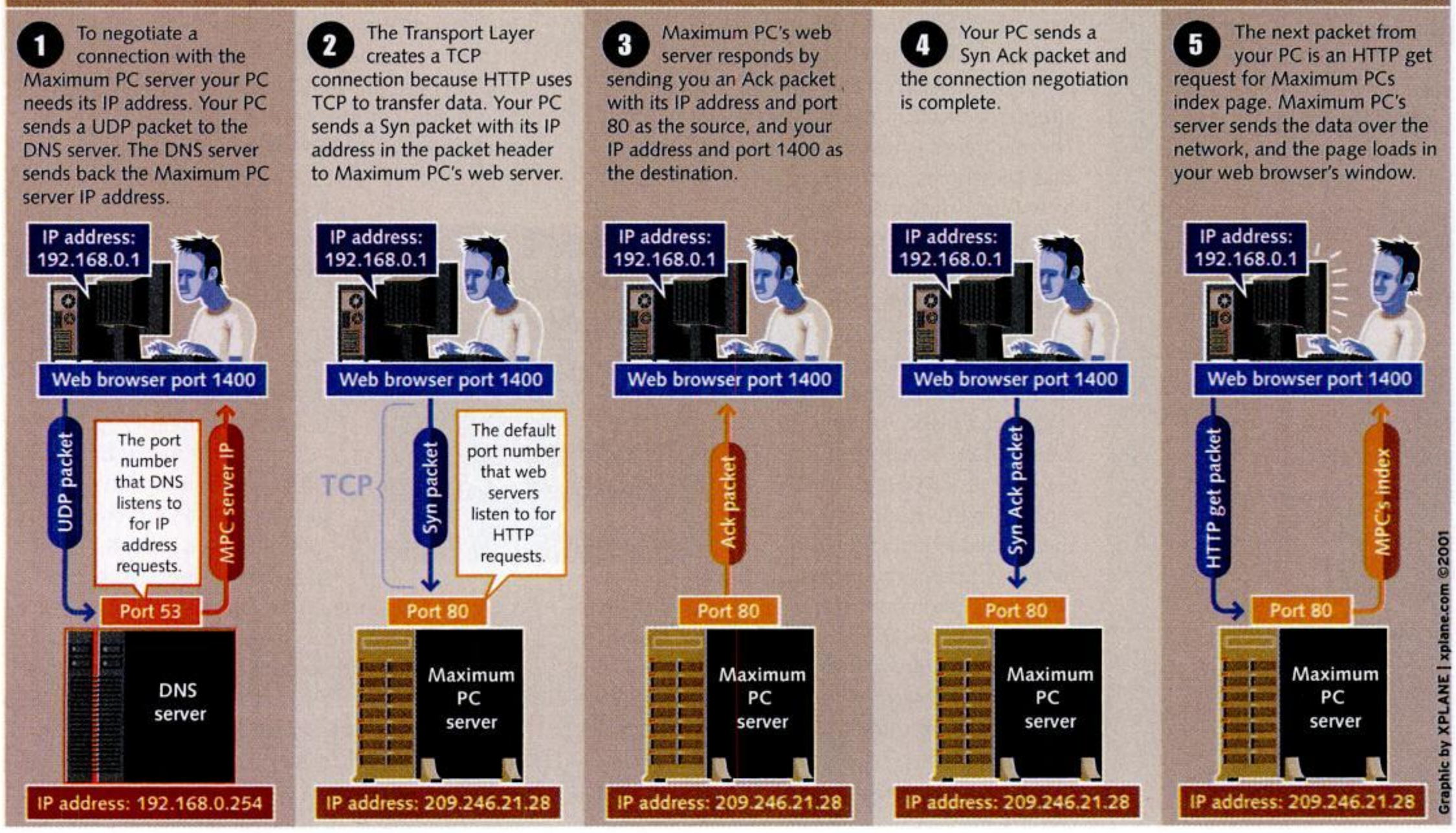
So, why does all this layer stuff matter? Because all the data that goes out onto the network has to go through a version of the stack, and any data sent by a TCP/IP stack can be read by any other computer with a TCP/IP stack. This means that your computer and every other computer on the Internet share a common language. This is very important, since most of the web servers on the Internet run different OSes than those used on the average home PC.

What actually happens when you type **www.maximumpc.com** into your web browser? Check out the graphic below for another step-by-step look at the process.

—John "Dalantech" Kimber and Maximum PC staff

IP Connect-o-Rama

So, what's really going on when you type www.maximumpc.com into your web browser and press return? For our purposes, let's say that the Transport Layer assigns your web browser port number 1400, your IP address is 192.168.0.1, and the IP address of your Domain Name Server (DNS) is 192.168.0.254. Here are the steps in order:


1 To negotiate a connection with the Maximum PC server your PC needs its IP address. Your PC sends a UDP packet to the DNS server. The DNS server sends back the Maximum PC server IP address.
2 The Transport Layer creates a TCP connection because HTTP uses TCP to transfer data. Your PC sends a Syn packet with its IP address in the packet header to Maximum PC's web server.
3 Maximum PC's web server responds by sending you an Ack packet with its IP address and port 80 as the source, and your IP address and port 1400 as the destination.
4 Your PC sends a Syn Ack packet and the connection negotiation is complete.
5 The next packet from your PC is an HTTP get request for Maximum PCs index page. Maximum PC's server sends the data over the network, and the page loads in your web browser's window.
IP address: 192.168.0.1
Web browser port 1400
UDP packet
The port number that DNS listens to for IP address requests.
MPC server IP
Port 53
DNS server
IP address: 192.168.0.254
TCP
Syn packet
The default port number that web servers listen to for HTTP requests.
Port 80
Maximum PC server
IP address: 209.246.21.28
Ack packet
Syn Ack packet
HTTP get packet
MPC's index
Graphic by XPLANE | xplane.com ©2001

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ASK THE DOCTOR

Symptom | Diagnosis | Cure

Even the burliest of PCs comes down with a bug every now and then. That's when you need to call The Doctor and get a diagnosis that'll have you up and running in no time. Send your symptoms to: **doctor@maximumpc.com**

Overclocking Uncertainties

I'm running a 700Mhz Athlon on the Abit KA7 mobo. I have plenty of cooling. I purchased the Antec SX1030 case recommended in the November 2000 issue. I have four 80mm fans, the Turbo Cool 2X auxiliary power supply cooler used in the 2000 Dream Machine, and dual fans on the processor. I'm wondering what the easiest method for overclocking my CPU is, and what max speed is safely attainable.

*—**Brian** Weiner*

With your setup, you're certainly off to a good start for overclocking, Brian. However, the only way to actually *know* what speed you can hit is to just flat-out see how far you can go. Issues to take into consideration are the motherboard's ability to use higher voltages so the processor can run stable at higher speeds, the adequacy of your cooling solutions (we like Thermaltake's Chrome or Super Orbs and case blowholes), and your peripherals' ability to withstand overclocking.

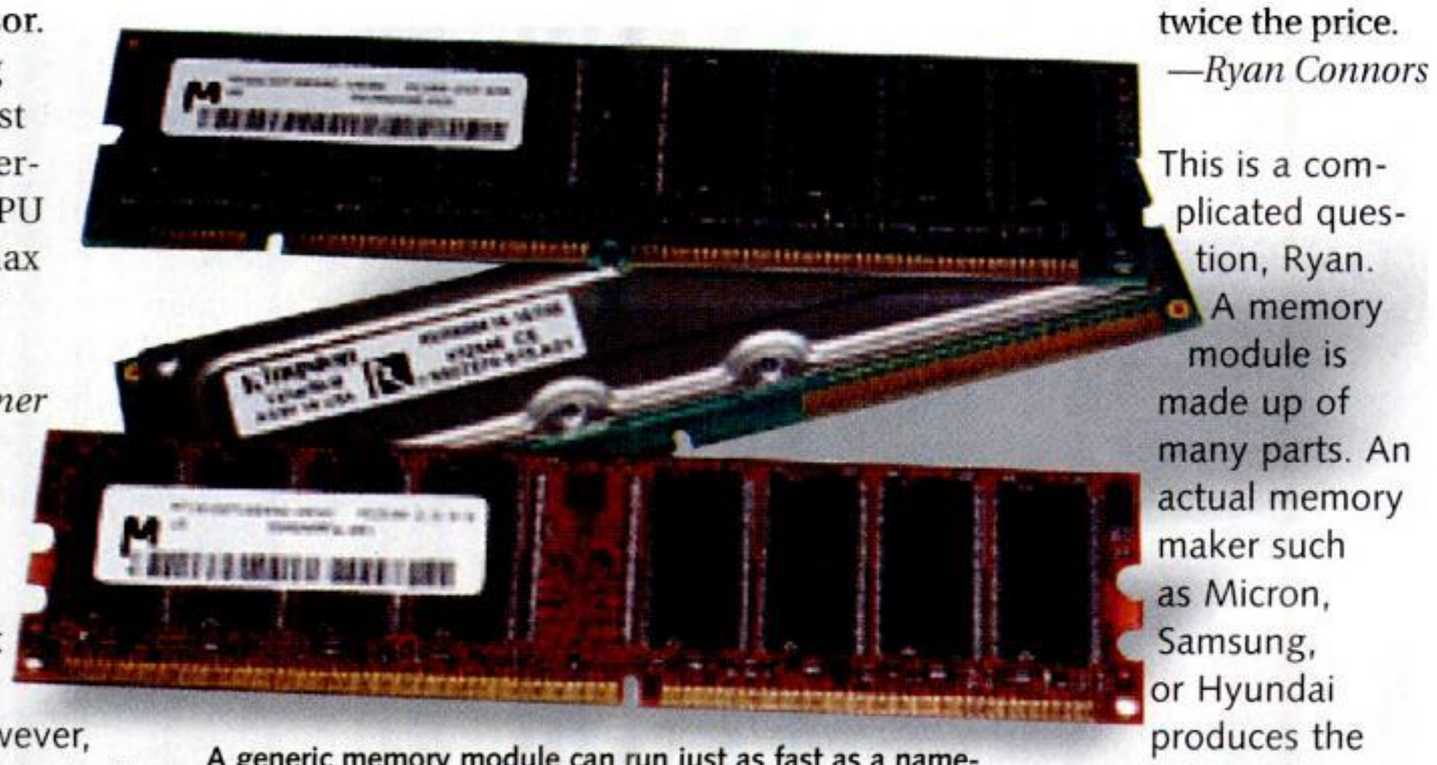
One of the best resources for overclockers is **www.overclockers.com**, where you can look up a processor's speed potential in the site's CPU Database. For example, that 700MHz Classic Athlon you have, Brian, is reported as running at 1.1GHz on a KA7 motherboard. Keep in mind, the database is compiled of numbers posted by individuals who have overclocked their procs; therefore, you don't know for sure that everything reported is trustworthy. Practice common sense when referring to the database; while some numbers, such as the 1.1GHz number mentioned above, seem entirely plausible, others seem unlikely without the use of *radical* cooling methods.

> **"The only way to know what speed you can hit is to just flat-out see how far you can go."**

Name-brand RAM

I'm hearing mixed opinions on whether RAM is significantly better if it's a major brand such as Micron. I have an Athlon proc, so I can't run my 128MB RAM above 100MHz. Will it make a noticeable difference to upgrade from unbranded RAM to Micron RAM? I don't think that it could make much of a difference, especially since it's almost twice the price.

—Ryan Connors



A generic memory module can run just as fast as a name-brand module, but name-brands are guaranteed to work.

This is a complicated question, Ryan. A memory module is made up of many parts. An actual memory maker such as Micron, Samsung, or Hyundai produces the memory chips. These chips are sold to module makers such as Kingston, Crucial Technology, or Corsair, which then produce memory modules that house the memory chips. There are only a handful of memory chip manufacturers, but dozens and dozens of module makers. The reason The Doctor generally recommends that you buy name-brand RAM is to ensure that you get what you pay for. Some generic memory module makers don't follow the specs, use poor-quality components, and/or use a hodgepodge of memory chips that they bought for cheap.

By buying name-brand RAM, you know that you're getting a PC133 memory module that's actually manufactured to spec. This doesn't mean that buying name-brands will always give you the best performance, however.

A generic module could run just as fast as a name-brand module. But a generic module may also give you blue-screen headaches to no end. If you do decide to buy generic memory, make sure you buy it from a store or web site that you trust and that offers a fair return policy.

This month:

- Overclocking Uncertainties
- Name-brand RAM
- Multi-booting Multiple Windows
- Clearing Crazy CMOSes

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www.maximumpcmag.com

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Multi-booting Multiple Windows

I was thinking of dual booting between Win98 or ME and NT and 2000. Right now I'm running WinME and use it for gaming and home business. My daughter uses it for homework, Internet, and gaming as well. I was thinking of making a Win98 partition just for gaming, an NT 4 partition for scanning and business, and/or a partition for Win 2000. I'm looking at booting everything from the SCSI drive but was wondering how that would affect the system since it would be booting from the Adaptec SCSI card. Will that affect performance in booting and rebooting between OSes?

—Richard D. Wisinski

The Doctor frowns on running Windows 98, ME, NT 4, and 2000 on the same machine. The reasoning behind this is that Windows 98 and ME are based on the Win9x kernel, while Windows NT 4 and Win2K are based on the Windows NT kernel. To match two Win9x kernels and/or two NT kernels on the same machine can cause a tremendous amount of problems.

Thanks to Windows 2000's awesome implementation of profiles, you can set up a separate account for you and your daughter. This means that you will each have your own e-mail, bookmarks, desktop, My Documents directory, etc. If you play lots of older games, you'll probably want to also have Windows 98 or ME installed—either will do.

When you're installing Win9x or ME and Win2000 on the same system, make sure you install Win9x or ME *first*, and then install 2000, not the other way around. Win2000 is capable of recognizing that Win9x is installed, but Win9x will leave your Windows 2000 partition inaccessible if you install it last.

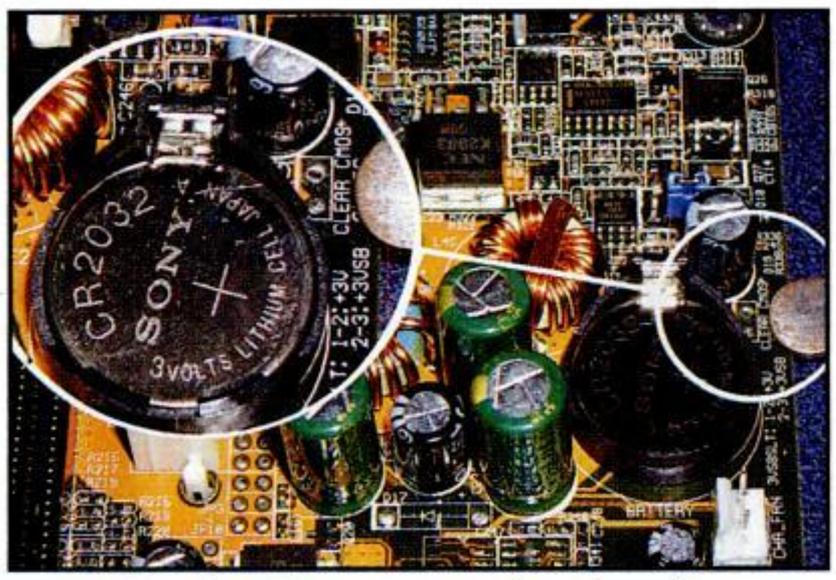
Rule of thumb: Boot from the fastest hard drive, regardless of interface. The downside to booting from SCSI is that it takes longer to boot by going through an additional BIOS.

> **"The downside to booting from SCSI is that it takes longer to boot."**

Clearing Crazy CMOSes

I'm not sure where to turn. I have an Asus A7V motherboard, and I've had the monitor black out when using it. The problem is hard to determine since I can't see what the computer is doing. Upon rebooting, I can't get any video signal, either. So, how do I fix this? I've tried clearing the CMOS by shorting the little contact points but that doesn't seem to do the trick.

—Reed Richards



You need to short the two contacts for at least five seconds with the power off to clear the CMOS.

The problem could be a couple of things, Reed. You're right to start by clearing the CMOS on the motherboard, but perhaps you didn't do it effectively. Asus has a really goofy way of clearing the CMOS on its boards. On the Asus A7V, you need to get a metal object (The Doctor uses a large pair of tweezers) and use it to short two little contact points near the battery. Other Asus boards have the CMOS-clearing points elsewhere—check your manual to find out where that is. Remember, you need to short those two contacts for at least five seconds with the power turned off. Yes, this is perhaps one of the most idiotic ways to clear the CMOS. The Doctor called the folks at Asus to find out the reasoning behind this method, but even they couldn't say why. Sounds like a question for the Asus techs over in Taiwan.

Once the CMOS has been cleared, you can get to work on the actual problem, which could range from a faulty monitor to Windows simple inability to restart your monitor after it goes into Sleep Mode. ✹

Rounding the Cables

I have two points to make:
1) ATA/66 hard drives use only 40 pins, the same as any ATA/33 drive.
2) ATA/66 cables have 80 conductors or wires to prevent induced voltage to the other conductors. (The magnetic pulse from a signal on a wire can "warp" or corrupt a signal on another wire.)

So, if you break up the cables and pack them in a tight bundle, you are defeating the purpose of an 80-conductor cable. Am I correct? Doesn't this have a possibility of lower speeds and data corruption?

— Russ Sawatzki

Your theory is sound, but not correct, Russ. It's possible to round an ATA/66/100 cable. The trick is making sure the ground wire associated with each data wire is not cut or you'll compromise data integrity. It's good to group these two cables together instead of separating them. But it's not necessary, as separating the cables won't undermine data integrity. The ground wires reduce noise and interference by making a connection at the end of the cable, not in the middle of it. As long as the insulation on the wires isn't cut, things are rosy.

There is another option if you're feeling queasy about slicing a part of the cable. The best way to preserve data integrity is to simply fold the cable in half down the center and then fold it again. Use loosely-bound zip ties to keep the folds from opening and you're set. You've streamlined the cable without using a scalpel.

Cut, Copy, Paste

Your spelling of Dynomat is incorrect. The correct spelling is Dynamat. The difference is that one company makes absorbency products (**www.dynomat.com**) and the other makes the sound dampening material (**www.dynamat.com**). I had a rather puzzled look upon visiting Dynomat's site, trying to figure out how I was going to fit a giant absorbent sock in my case. He he he.

— Jeremy Hartmann

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What to Review, What to Review?

If you want to witness desperation, check out a *Maximum PC* reviews-section planning meeting. Our editors will stop at nothing to secure review slots for the products under their care. As the initial arbiter of what will and will not be reviewed, I'm hit with bribes, brown-nosing, and, yes, even offers for free hardware (thanks for the GeForce2 Ultra, Will).

Ultimately, however, our coverage is decided by the court of public opinion. Your vote counts, and we do our best to gauge reader interest and stock the reviews section accordingly. If you want us to change our mix of coverage, or want to see a specific product reviewed, let us know. My e-mail address is jnorem@maximumpc.com, and I'm always looking for suggestions on what we should lambaste or celebrate in upcoming issues.

Just don't ask for a review of the DPT Decade RAID controller, please—our sedative prescription just ran out.

VALENTINE'S DAY TIPS FOR GEEKS

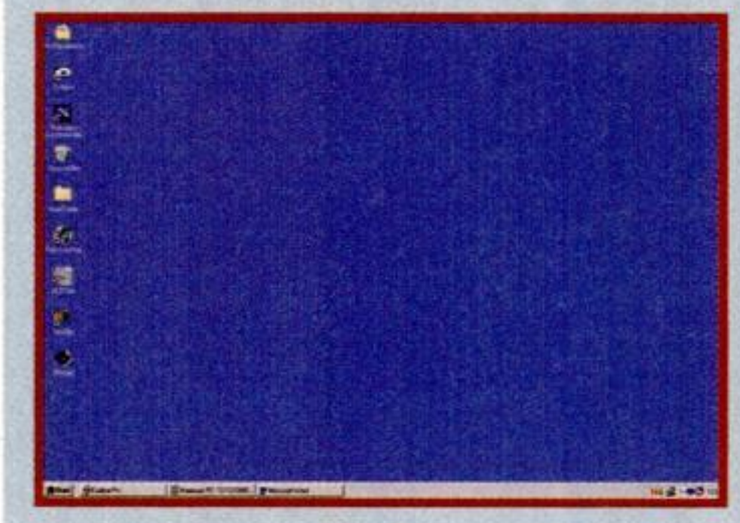
It's common knowledge that finding a single, computer-loving male is extremely difficult. Luckily there's a guide for all the lovely lasses who are looking to bag a pale-skinned *Maximum PC* reader. Ladies, point your browsers to **http://college.antioch.edu/~totally/geek.html** for "A Girl's Guide to Geek Guys," the authoritative low-down on how the nocturnal species operates.

And while most computer-loving guys already have girlfriends (they're about two feet tall and overclocked), there's also an online guide for fellas who haven't yet found Ms. Right: **www.eecis.udel.edu/~masterma/GuideToGeekGirls.html**. You better hurry on over unless you want to spend Valentine's Day in an AOL chat room exchanging sweet-nothings with the cyber-age equivalent of Grandma Walton.

—JOSH NOREM, REVIEWS EDITOR

Sometimes a Shortcut Is Just a Shortcut...

If you want a portal into the psyche of the average PC freak, look no further than his desktop. From the wallpaper in the background to the shortcuts in the foreground, desktop doo-dads can reveal more about a geek's personality than 10 years of therapy. Here we analyze the troubled desktops of three *Maximum PC* editors...



While Jon's deep-blue background color indicates a certain relentless optimism, the fact that his desktop is almost entirely bereft of content suggests a vacuum, an emptiness, a deep inner void. This dichotomy thus reveals a man in conflict. Either that or Jon cleaned up his desktop before our analysis began.

Gordon's desktop suggests a psyche on the verge of breakdown. Like many of the criminally insane, Gordon displays the fruits of his labor (i.e., shortcuts) for public recognition—similar to a serial killer leaving behind "trophies" for discovery by the police. The Star Trek outfit? The choice of "Command Class" yellow suggests Jon should begin bracing for a coup d'etat.

Pretty kitty. Pretty, pretty kitty. Would kitty like to talk about his troubles? Would kitty like to explain all the random icons sitting at the left of the desktop, long ignored since their creation? Come now, kitty, surely the icons must have some significance, no? Fine then, remain silent. But young master Norem won't "get better" until you open up.

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A behind-the-scenes look at the Maximum PC Lab and the gearheads who work in it.

28 PRODUCTS REVIEWED!

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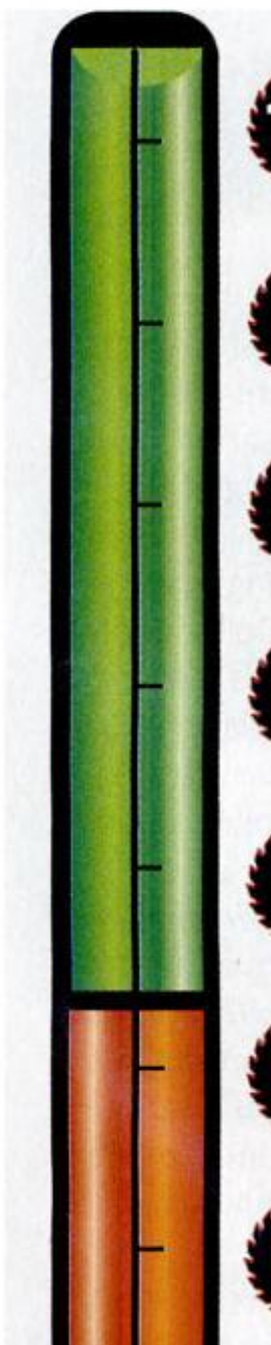
The Maximum PC Verdict-O-Meter

We use a 1-to-10 rating scale to summarize a review product's merit. This barometer of lustworthiness has been in place since the first issue of the magazine, yet we've never fully explained it to our readers. Until now. Herewith, we shed light on the subjective, inexact science of the Maximum PC Verdict-O-Meter.



10 To receive a 10, a product must demonstrate not only decisive superiority over other products in its class, but also groundbreaking new features or unprecedented attention to detail.

9 An excellent product that suffers from one or two small flaws. Not major flaws, mind you, just niggling complaints. A 9 product can still be the best product in its class.

8 While still a "buy" recommendation, an 8 verdict signifies one significant flaw, or a combination of small, slightly disturbing flaws. This verdict is the lowest rung of the upper echelons of verdictdom.

7 A puzzling piece of hardware or software. Products that receive 7s typically have an odd mixture of positive and negative attributes and truly sit on the border between fame and infamy.

6 This is where a product begins to stink up the Lab. While it might essentially work as advertised, a product that receives a 6 is probably the third or fourth best choice in its particular category.

5 Don't buy this product until bugs are fixed, features are added, or performance is improved. It sucks, but it's not egregiously bad.

4 Bad news. The product is buggy, lacks features, and is an affront to PC power users. The product might only be spared from a lower verdict because it boasts a single attribute that's worthy of praise.

3 This product is bad. Really bad. It shouldn't be sold to the general public in its current form.

2 This product just plain doesn't work. What was the vendor thinking? Someone should lose his job for releasing such trash for retail.

1 This is class-action lawsuit material—a product that not only doesn't work, but also causes harm to products that do work. It destroys test systems and maims staffers.

As for our Kick Ass Award, it is discretionary for 9 verdicts and automatic for 10 verdicts. The award signifies a product that knocked our pantaloons off. It's our ultimate stamp of approval.

CHECK IT OUT **Online**

www.maximumpc.com

Benchmarking: Full Disclosure

Visit **www.maximumpc.com/benchmarking** for the complete lowdown on *Maximum PC*'s benchmarking strategies.

Hardware photography by **AARON LAUER**

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Lean and Mean Speakers

FLAT-PANEL TECHNOLOGY HITS 4.1 MARKET

Although flat-panel technology is far from ubiquitous, both Monsoon and Boston Acoustics have cooked up impressive 4.1 flat-panel systems. We pit them against each other here—the best 4.1 flat-panel speaker system will now be crowned.

MONSOON PLUSES
- Incredible warmth
- Cover a wide frequency range
- Ample power

MINUSES
- Midrange distortion at moderate volumes
- Short rear speaker cables
- Speaker stands were problematic

BOSTON PLUSES
- Quad gaming and Dolby Digital at 4.1
- Awesome for DVDs

MINUSES
- Comparatively underpowered
- Lack warmth
- Muddy bass

Monsoon MM-2000

Monsoon speakers aren't known for teeth-rattling power, but rather for superb warmth and the ability to create a large, inviting soundstage. The MM-2000 system bolsters this reputation, offering warm sound, abundant clarity, and superlative power for its class. However, this level of quality comes at a price that's $50 more than the almighty Klipsch ProMedia 4.1, and that makes recommending this system very difficult.

Comparisons to the Klipsch are easy: The MM-2000s offer the same dual analog inputs, the same 4.1 configuration, the same multi-driver subwoofer, and a power rating that's only 60W shy of the ProMedia's deafening 400W output. At lower volumes, the MM-2000's four satellites produce richer sound than the ProMedias, but crank up the volume and these speakers lose their cool. The sats experienced heavy clipping when reproducing Mazzy Star's acoustic guitar.

The speakers' defining feature is their palpable warmth and capacity

Monsoon's MM-2000 speakers pump 340W of warm, rich sound.

to envelope the listener in a cocoon of sound that's rich and dynamic. However, the rear-channel speaker cables are so short, we weren't able to place them behind us, which would have enhanced the experience further.

It's a shame these speakers cost more than the Klipsch, because it leaves us with little reason to recommend them. We say "shame," because these really are excellent speakers. A cut in price could easily earn the MM-2000 system a Kick Ass.

Boston Acoustics BA7500 Digital

The BA7500s share the same 4.1 design and dual analog-in jacks as the MM-2000s, but include a Dolby Digital decoder and digital-in as well, allowing for 4.1 Dolby Digital audio. Overall, the Boston Acoustics speakers produce slightly above-average sound quality, but suffer from a lack of warmth and projection, as well as sloppy bass due to the bandpass (ported) design of the subwoofer.

We're not sure what the RMS wattage rating is for the BA7500s, but the maximum sound pressure level is 107dB, compared to the MM-2000's 108dB, and the ProMedia's 110dB. Suffice it to say, the BA7500s wattage seems lower than its competitors'.

The BA7500s do quad gaming and Dolby Digital decoding in one fell swoop, but unfortunately lack power and clarity.

The lack of power is most evident at higher volumes, where the bass is muddy and scattered and the satellites produce crisp highs but almost zero midrange.

These speakers' saving grace is their ability to decode Dolby Digital into five discrete channels. There's no center channel, but placing the sats next to your monitor creates an excellent virtual channel. During testing with *The Matrix*, sound panned smoothly between channels, effects were well-placed, and bass response was adequate. It's also nice to be able to plug both analog and digital inputs into the soundcard (we used an SB Live!), and to switch between Dolby Digital and quad-analog for gaming.

In the end, these speakers are compromised. Their performance is sub-par for games and music, but they excel at DVD playback and games. Which is more important depends on your usage habits.

—Josh Norem

MONSOON MM-2000 8
$300 | Monsoon
www.monsoonaudio.com
877.PC-AUDIO

BOSTON ACOUSTICS 7
$300 | Boston Acoustics
www.bostonacoustics.com
978.538.5000

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

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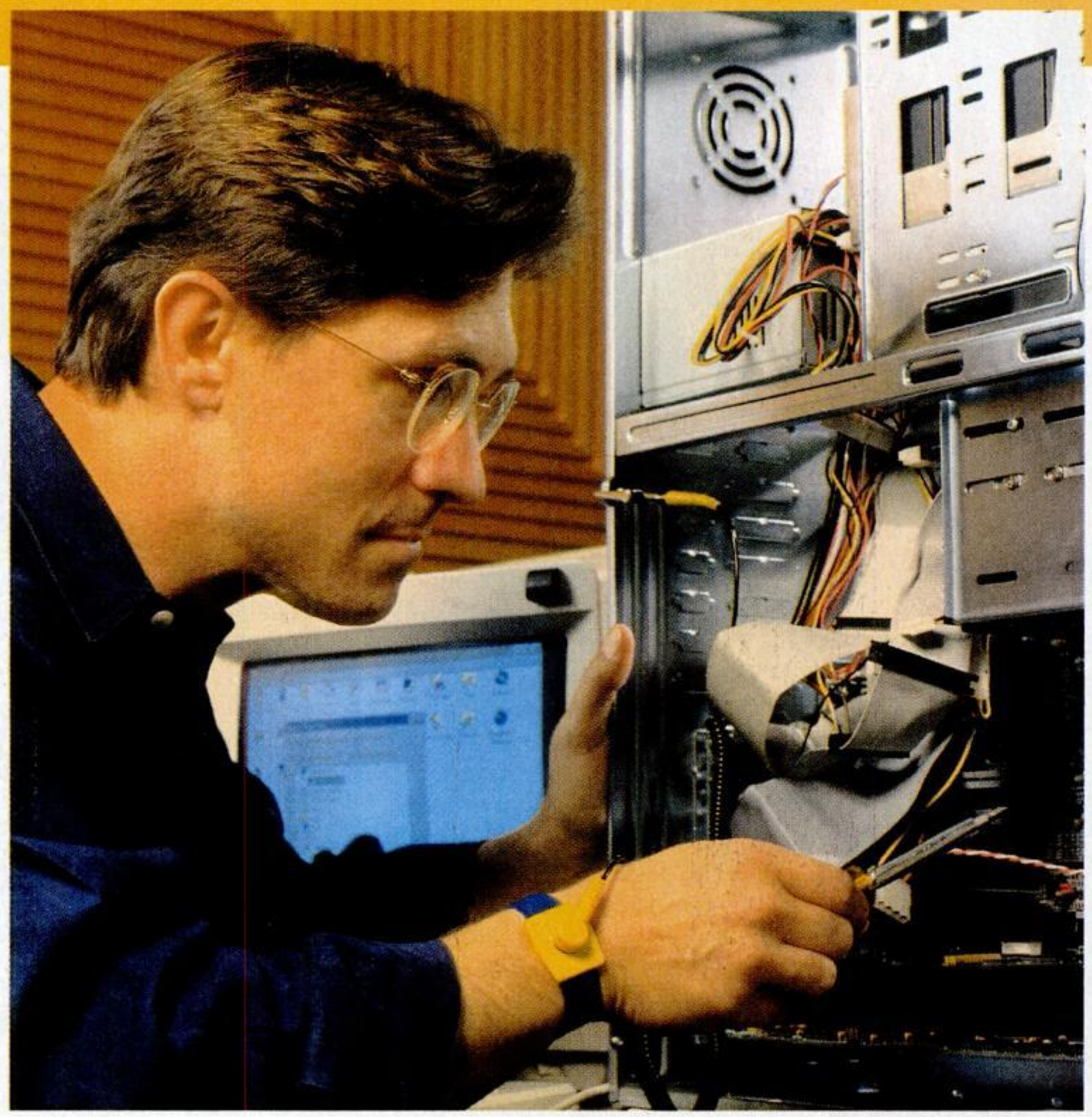

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Hewlett-Packard Pavilion 9720

GARGANTUAN GIGAHERTZ BOX ONLY AVERAGE

HP proffers its highest-clocked Athlon ever.

PLUSES
- 1.2GHz Athlon
- Front-mounted IEEE, serial ports
- Roomy case
- Wind tunnel cooling

MINUSES
- Uneven performance
- Only CPU is cutting edge, everything else is six months old (or more)
- No free DIMMs

We had high hopes for Hewlett-Packard's fastest Athlon-based PC. Packing a 1.2GHz AMD Thunderbird Athlon, we expected the HP to slice through benchmarks like a light saber through Ewoks. Unfortunately, HP's newest Pavilion achieved only average scores.

While the freakishly tall HP has a 100MHz edge over the Voodoo Monsoon reviewed last month, the HP ran neck-and-neck in the *SYSmark2000* Windows application test and way behind in our *Photoshop 5.5* action script. What up? We suspect hard drive performance, as there are several reverts in our action script that rely on reads from the drive, possibly causing the single-drive HP to lose to the RAID-equipped Voodoo. It's entirely possible that the speed of the RAID array was just enough to offset the HP's clock speed advantage.

The extra 100MHz helped out with the gaming benchmarks, however. The HP pulled about an 11fps advantage over the Voodoo system in the OpenGL game *Quake III Arena* and eked out about eight more frames in our Direct3D gaming test—both top scores for a GeForce2-based system. In fact, this is the fastest of the Athlon-based PCs we've tested.

Another strength of the 9720 is its monstrous case. The company finally dumped its teeny-weeny, "power supply blocking the PCI slot" case in favor of a strapping mid-tower behemoth. The new case features three external full-size drive bays and two external 3.5-inch bays. Hewlett-Packard again uses a Pinnacle Studio DV card and wisely ports the IEEE-1394 connectors at the front of the machine. HP also includes a front-mounted 9-pin serial port alongside the two USB and FireWire ports—a nifty feature if you have legacy serial devices, such as a Palm cradle, that you want plugged in up front.

In the audio department, Hewlett-Packard went with a Creative Labs Sound Blaster Live! Value and Cambridge SoundWorks FPS2000 4.1 speakers. While we can't argue with the choice of the Live! card, the FPS2000 speakers were bad when we reviewed them more than a year ago, and they're still not all that.

UNDER THE HOOD

THE BRAINS

CPU	AMD Athlon 1.2GHz
L2 cache	256K full speed
RAM	256MB CAS2 Crucial Technologies PC133
Motherboard	ASUS "Tahiti" with VIA KT133 chipset
Drive bays	Three 5.25-inch, two external 3.5-inch, two internal 3.5-inch
I/O ports	Four USB 1.0 ports | Three IEEE-1394 | Two serial | One parallel

DISPLAY

Video	ASUS V7700 GeForce2 GTS, 32MB
Monitor	19-inch HP V90, 18-inch viewable
Refresh@ max res	75Hz@1600x1200

STORAGE

Hard drive	75GB IBM75GXP 7,200rpm
DVD	16X Pioneer 115
CD-RW	8/4/32 LG CD-RW CED-8080B
Removable	3.5-inch floppy drive

NETWORKING

NIC	10/100 Ethernet on motherboard (RealTek RTL8139A)
Soundcard	Creative Labs CT4830 Sound Blaster Live!
Speakers	Cambridge SoundWorks FPS2000 Digital

THE BUNDLE

Microsoft Windows Millennium, *Works* | Microsoft *Money*, *QuickLink III* | *My Photo Center* | Adaptec *Easy CD Creator 4.0* | *Trellix Web* | Pinnacle *Studio DV* | Pinnacle *Studio Family*

BOOT 0:31 DOWN 0:10

For storage duties, HP chose a second-string LG electronic 8x4x32 drive paired with a first-rate 16x Pioneer DVD-ROM drive. CD-R drives are now hitting 12x and 16x, so an 8x drive is far from cutting-edge.

Hewlett-Packard has long used ASUS motherboards, and that partnership remains intact with its Athlon offerings. The 9720's custom ASUS motherboard uses VIA's KT133 Athlon chipset in a mini-ATX form-factor. To make up for a dearth of PCI slots, ASUS designed a special connector that snaps additional PCI slots onto the motherboard. It's a neat trick because it allows HP to use the same motherboard in its smaller cases as well. For consumers, however, there's nominal value besides the ability to say to your friends, "Hey, check out my trick motherboard." And like all big vendors, HP has stripped out many of the BIOS controls to keep you from hurting yourself.

HP has prepped the 9720 for some serious cooling. With its clear CPU wind tunnel and mounting points for a massive 120mm fan, the 9720 is the PC equivalent of an igloo.

Overall, the Pavilion 9720 offers average performance. That is, if you consider 1,200MHz and 100fps gaming to be "average." We applaud HP's move away from smaller cases and its ability to get us the fastest Athlon available, but there's still plenty of room for improvement. However, for those who want it, the 9720 offers the safety of a major brand-name and the promise that the company will still be offering support in two years.

—Gordon Mah Ung

TEST	ZERO	SYSTEM	RESULTS (%)	RANK
SYSmark	174	205	17.8	2nd Seed
Hard drive	20.2MB/sec	28.6MB/sec	41.5	Unseeded
CD-ROM	26x	30x	15.0	2nd Seed
Photoshop	170sec	114sec	32.0	3rd Seed
Direct3D	38fps	82.4fps	116.8+	Unseeded
OpenGL	34.4fps	100fps	190.8+	3rd Seed

Full benchmarking details at www.maximumpc.com/benchmarking/index.html.

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EXPANSION NOTES

In Hewlett-Packard's new big-ass case, there's room to add drives and expansion cards; the two free PCI slots are nice, too. We're a little puzzled, however, since the company chose to fill the only two memory slots available.

EXPANSION MAP

AGP: Videocard
PCI: Free
PCI: Soundcard
PCI: Modem
PCI: Free
PCI: IEEE-1394

CASE | COOLING | POWER

CASE

Full ATX tower with two additional external bays.

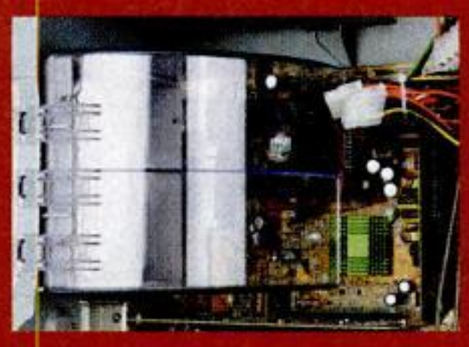
COOLING

A sole CPU fan and see-through wind tunnel keep the 1.2GHz Athlon cool, and the case has the provision for a fat 120mm fan.

POWER

250 watt Lite-On Power Supply.

Moldy oldy. These FPS2000 speakers sounded ripe in 1999 and the smell hasn't gotten any better.



Ready to vent. Adding extra cooling is a snap with the 9720, thanks to this plastic fan shroud and mount for a 120mm fan.

LEGO motherboard? The ASUS motherboard adds two PCI slots with a nifty snap-on adapter.

Night surfing. HP's USB keyboard features two USB ports and a row of buttons that light up in blue.

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FireWire Scanner Fisticuffs

FASTER INTERFACE IS A WELCOME IMPROVEMENT

EPSON PLUSES
Fast scans and amazing clarity
Ridiculous resolutions
Dual Focus technology makes having a film adapter worth it

MINUSES
No Windows 98 SE support for FireWire

UMAX POWERLOOK PLUSES
Really fast scans at higher resolutions
CCD captures phenomenal detail
42-bit color

MINUSES
FireWire card sold separately
Transparency scanning could have been better

UMAX ASTRA PLUSES
Extremely fast
Standard 42-bit color depth
Windows 98 SE support and included FireWire card

MINUSES
Crappy transparency adapter
Occasional oversaturation of color
Software isn't very sophisticated

The speed of a flatbed scanner is determined by three main factors: the speed of the carriage drive that moves the scan head, the time it takes the CCD array on the head to pick up images, and the power and intensity of the lamp. Improvements in scanner technology translate into reduced scan time for high-resolution images.

But the speed of a scanner doesn't mean squat if it has a crappy interface and gets bogged down transferring newly scanned images to the computer. Most scanners have a USB interface that offers a horrendously slow 1.5MB/sec transfer rate. And even if you're lucky enough to have a high-end Fast SCSI model, you're looking at just a 10MB/sec rate. Enter the first of the FireWire scanners, designed for the hot-swapability that USB enjoys, while also offering lightning quick speeds of 50MB/sec. As scanner technology has evolved, so has the interface—think of FireWire as the next evolution in the effort to eke out greater speed from scanners.

Here's the scoop on the newest FireWire scanners from UMAX and Epson, two professional and one consumer model—each of them ready to chew through your images with a vengeance.

With the highest optical resolution and the sharpest scans in the bunch, it's no wonder the Expression 1600 took home the Gear of the Year 2000 prize.

Epson Expression 1600 Pro FireWire Scanner

Designed for professionals, the Epson Expression 1600 Pro FireWire Scanner is quite possibly the best scanner we've tested. Some of you may recognize this scanner from the December 2000 Gear of the Year issue. It took top honors for having the highest optical resolutions this side of a publishing house drum scanner, beautiful color reproduction for photos and transparencies, and ridiculous speed at lower resolutions.

To wit, scans of a color 4x6 photo took a scant nine seconds at 300dpi, one minute and six seconds at 800dpi, and two minutes and 24 seconds at 1,200dpi—not too shabby; most SCSI scanners take up to six minutes at 1,200dpi. Scans are crystal clear, thanks to a staggering 1,600x3,200 hardware dpi maximum resolution at 36-bit color depth. Epson's Micro-Step Drive uses interpolation for a ridiculous 12,800x12,800 resolution to blow up pin-size details to the size of the Empire State Building, so you can scan in a photo and use software to crank up the resolution for minute details. Built-in color and gamma corrections have presets for different types of printers and monitors and are also customizable for individual preferences (to bring out details in negatives, for example).

In addition to a transparency adapter for film and slides, the Expression 1600 includes a Dual Focus mechanism that shifts head focus when scanning negatives. This compensates for the tendency of scanners to create halos or rings around scans because they're placed above the traditional scanning surface. The cherry on top is the scanner's use of a cold cathode fluorescent lamp that uses Xenon gas kept in a ready-state at room temperature, eliminating the long warm-up times traditionally associated with scanners.

The only minor downside is the ColorTrue Imaging System that automatically enhances some colors, but can oversaturate photos that contain areas of already bright colors. Luckily, you can compensate by customizing balance, tone, and curves. Another beef we had with the Epson is that it includes ports for FireWire, USB, *and* SCSI—cool, right? Well, in order to take advantage of the IEEE-1394 interface, you have to buy a FireWire card, and run Windows 2000. The USB and SCSI interfaces, on the other hand, only work in Windows 98. Otherwise, Epson's new Expression is a superior scanner that any professional should take a good, hard look at.

UMAX PowerLook 1100 FireWire Scanner

The PowerLook 1100 is UMAX's entry into the FireWire playing field, and an impressive entry at that. Also aimed at the professional audience, the PowerLook 1100 is right on the cusp of UMAX's consumer scanners and its hardcore, high-end profes-

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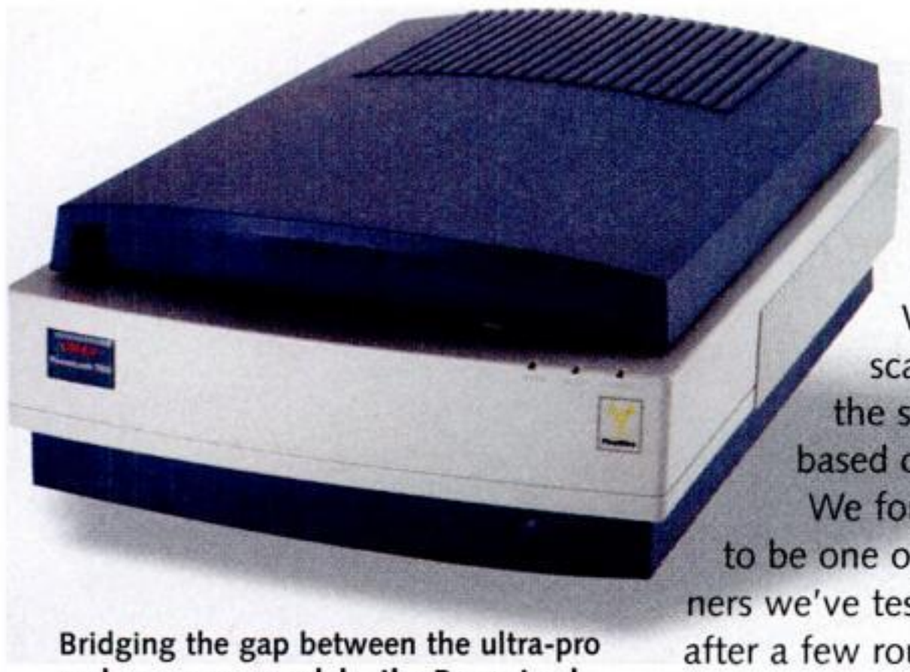


Bridging the gap between the ultra-pro and consumer models, the PowerLook 1100 is crazy-fast at high resolutions.

sional models. With the benefit of FireWire, it's no slouch when it comes to scanning hi-res images. Our trusty 4x6 photo was scanned in 42 seconds at 300dpi, two minutes and 20 seconds at 800dpi, and two minutes and 45 seconds at 1,200dpi. At lower resolutions, the PowerLook 1100 is the slowpoke of the pack, but it pulls ahead at resolutions above 1,000dpi—the same goes for transparencies. The 1,200x2,400dpi optical resolution is not as impressive as that of the Epson, but it outpaces the latter with a 42-bit output versus the Epson's 36-bit. The PowerLook also boasts BET (bit-enhancement technology) that enhances colors, shadows, and transitions between lines to bring out sharp detail in scans.

A 10,600 element tri-linear CCD is at the heart of the PowerLook 1100, and it offers phenomenal color reproduction with very little fading or oversaturation. We also like the super-large scanning area of 8.5 by 10 inches for the transparency adapter—as opposed to the 4-by-5-inch limitation of UMAX's consumer FireWire model—and the auto-detect feature that let us do slide batch captures (up to 12 at once). Best of all, the PowerLook works just fine with Windows 98 SE, so you don't have to upgrade to Win2000, a requirement of Espson's FireWire offering.

UMAX also offers completely customizable software bundles to cater to the exact needs of the user, whether it be artistic- or design-oriented. When you buy your scanner, you select the software you want based on your preferences. We found the PowerLook to be one of the loudest scanners we've tested, however, and after a few rounds of scanning, it began to really grate on our nerves. And while we were pleased with the overall performance of the PowerLook, we found richer color in photographs and transparencies in scans from the Epson, as opposed to sharper detail, especially in shadows, from the PowerLook. We would tell you that this trade-off is a matter of choice, but with more features and an additional USB and SCSI interface, we have to ultimately side with Epson.

UMAX Astra 6450 FireWire Scanner

The new UMAX Astra 6450 FireWire Scanner is the entry-level scanner in this group, catering to the consumer who is looking for the speed of FireWire in a scanner that is easy to use. For 300 bucks, it offers a comprehensive mix of speed and quality to push the consumer scanner a few steps closer to professional turf—but only a few. You can scan a 4x6 photo in 22 seconds at 300dpi, 52 seconds at 800dpi, and a blistering one minute and 58 seconds at 1,200dpi. This baby is fast, and scans are sharp enough to cut you, thanks to the single-pass UMAX head that scans at a max resolution of 600x1,200dpi at an obscene 42-bit color depth.

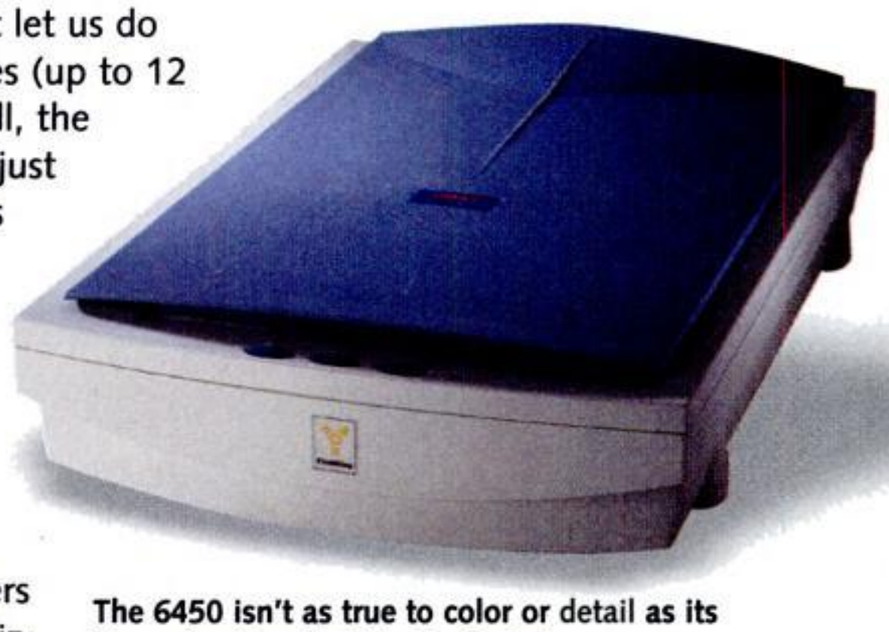
One of the coolest features of the Astra is that it is quite small, yet has a transparency unit built into the lid of the scanner. You can scan 4x5 slides or negatives under the illuminated lid. You can also perform one-touch scans, copies, and OCR with buttons on the front of the unit. Oh, and did we mention that the 6450 works with Windows 98 *and* includes a FireWire card?

All good things have a downside, however. While the 6450 is above average in scan quality and speed when it comes to scanning photos, we would have liked to see an optical resolution higher than 600x1,200dpi, and our scans came out with some oversaturation in spots of bright color. The negatives we scanned suffered from a horrible blue cast and shoddy color reproduction, making us wonder if the built-in transparency adapter is more of a marketing gimmick than a functional feature.

The software isn't as customizable as we would have liked and seems to have been dumbed-down for a wider consumer audience who won't be playing with gamma and tone levels. As a result, the color correction and tweaking options aren't as plentiful as they would be in a professional model.

At 300 bucks, the 6450 is a competent FireWire alternative for beginning users, but the scanner's limitations are enough to keep the 6450 well out of Kick Ass territory.

—Geoff Visgilio



The 6450 isn't as true to color or detail **as its bigger brother, but it's the fastest consumer scanner available for a nice price.**

THE SPECS
EPSON
COLOR PROCESSING
36-bit internal
OPTICAL SCANNING RESOLUTION
1,600x3,200 dpi
MAX RESOLUTION
12,800x12,800 (with interpolation)
MAX READ AREA
8.5"x11.7"
INTERFACES
USB, SCSI, and IEEE-1394
SOFTWARE DRIVERS
Win 95, 98, NT 4.0, and 2000 (only 2000 has FireWire support)

THE SPECS
UMAX POWERLOOK
COLOR PROCESSING
42-bit internal
OPTICAL SCANNING RESOLUTION
1,200x2,400dpi
MAX RESOLUTION
9,600x9,600 (with interpolation)
MAX READ AREA
8.5"x11.7"
INTERFACES
IEEE-1394
SOFTWARE DRIVERS
Win 98 SE and 2000

THE SPECS
UMAX ASTRA
COLOR PROCESSING
42-bit internal
OPTICAL SCANNING RESOLUTION
1,200dpi
MAX RESOLUTION
9,600x9,600 (with interpolation)
MAX READ AREA
8.5"x11.7" reflective
4"x5" transparency
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Optical Overachievers

THREE DRIVES PUSH THE CD-R DRIVE ENVELOPE

You say last month's CD-RW drive feature wasn't enough for you? You want more? You got it! Check out these three supremely fast CD-RW drives, each boasting the fastest specs in its respective class. And just so nobody feels left out, this roundup runs the CD-RW drive gamut: We've got a combo drive, a 16x burner, and Plextor's latest Ultra SCSI 12x PlexWriter. It's an optical orgy, so let's take a look at the latest forbidden fruit.

Ricoh's 12/10/32/8 combo CD-RW/DVD-ROM is a mouthful, and a kick-ass drive as well.

RICOH PLUSES
12x CD-R, 10x RW
No buffer underruns
WinDVD included
All around awesome

MINUSES
Slow audio-extraction rate average

Ricoh 12/10/32/8

Combo CD-RW/DVD-ROM drives have always been about increased functionality at the cost of top-notch speeds, but the Ricoh MP9120A is rewriting the rulebook. It offers top-of-the-line CD-RW specs (12/10/32), includes buffer underrun prevention technology, and doubles as an 8x DVD-ROM—what more could you want from an optical drive? During testing, the drive's performance was superb. It benchmarked in the vicinity of the top 12x drives from TDK and Plextor, and even beat both of them in maximum digital audio extraction rate tests. However, when the Ricoh drive encounters an error during extraction, it slows down to about 8x for the duration of the disk in order to ensure perfect copies, bringing down the overall extraction-rate average.

This drive shines in access times. Its scores eclipse leading IDE drives from both Plextor and TDK by a wide margin, so this drive will make an excellent CD-ROM replacement.

The Ricoh drive is the first combo drive we've tested to boast CD-RW drive specs comparable to top drives on the market. Its 8x DVD rating is great too, but the feature we were most stoked about is a buffer underrun prevention technology called "Just Link." It's made by Ricoh and works like Sanyo's Burn Proof, meaning you're almost guaranteed to never burn a coaster with this drive. During testing, we were able to defrag our hard drive while burning a CD.

Yamaha 16/10/40

We wanted to love this drive, but instead we're forced to report that it's one of the most unreliable drives we've ever tested. The Yamaha caused blue screens and disk errors on no less than three test systems, including a freshly formatted pristine machine! Yamaha representatives even came to our Lab to see the drive's questionable performance in action and came to the conclusion that it's extremely sensitive to variations in media. We'd say it's *way too* sensitive.

Throughout testing, the Yamaha drive failed to read brand-new, stamped CDs and had trouble

BENCHMARKS

MANUFACTURER	RICOH COMBO	YAMAHA	PLEXTOR
Model name	MP9120A	CRW2100EZ	12/10/32S
Buffer size	2MB	8MB	4MB
CD TACH			
Drive rating	22x	**25.3**	21.8x
Avg. sequential read speed (MB/sec)	**3.6**	4	3.6
Full stroke/random access times (ms)	168/87	**261/117**	267/122
Max CPU utilization	**6%**	**6%**	5%
AUDIO EXTRACTION			
Maximum extraction rate	**29.1**	32x	24.5x
Audio extraction time (340MB)	**2:00**	**1:57**	2:42
CD MASTERING			
Data CD creation	**6:36**	**5:38**	6:59
Mixed-mode CD duplication	**10:03**	**Wouldn't run**	10:00*
Game backup successful?	Yes	No	Yes
Software bundle	Prassi *PrimoCD Plus*, *abCD* packet writing, Intervideo *WinDVD 2000*	Adaptec *Easy CD Creator 4*, *Direct CD*, Adaptec *Toast* (Mac), Adobe *Photodeluxe*, Adobe *ActiveShare*, *Neato CD* labeling kit, MusicMatch *Jukebox*	Adaptec *Easy CD Creator 4*, *Direct CD*, CDRes-Q, *Plextor Manager 2000*

*Approximate time; see review for explanation.

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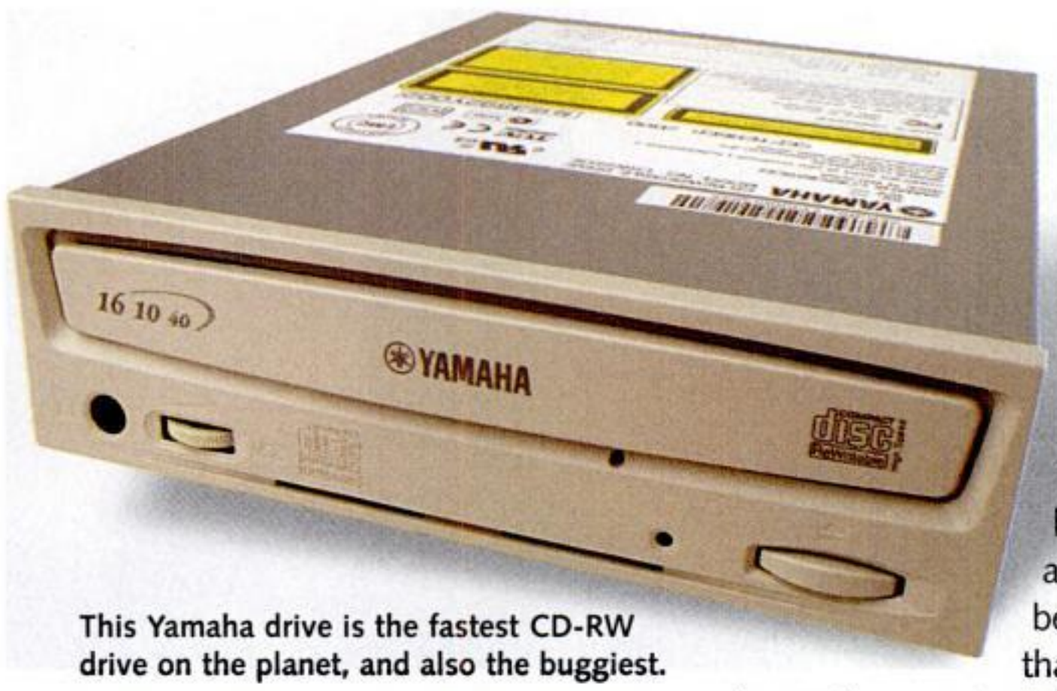

This Yamaha drive is the fastest CD-RW drive on the planet, and also the buggiest.

reading our standard benchmark CDs, even though all the previous drives could (and still can) read them with no problems.

Yamaha touts this drive as being able to record at 16x, but that's not the whole truth. The drive starts writing CDs at 12x; then, after about 15 minutes into the disk, it switches to 16x for the duration. It's also labeled as a 10x RW drive, but this too is misleading. The drive burns CD-RWs at 4x to 8x until it hits the outer edges of the disk, then switches to 10x. These variable recording speeds are the result of the drive's partial-CAV design, which is a combination of CAV (Constant Angular Velocity) and CLV (Constant Linear Velocity) rotation technologies. CAV spins the disk at a constant rate, so more data is written on the outer edges of a disk than on the inner edges. Once the drive writes up to a certain point on the disk, it switches to CLV, varying the disk rotation speed to ensure a constant recording rate of 16x.

This partial-CAV design is part of Yamaha's "waste-proof write strategy," which relies on a whopping 8MB buffer and the modulated write speed mentioned above to foster successful burns. It doesn't work very well, however. During testing, we were able to produce buffer underruns simply by playing MP3s during recording or running *Quake III*.

Plextor 12/10/32S

Whenever we receive a Plextor CD-RW drive for review, the question on our minds isn't, Is it any good? But rather, How good is it? Plextor drives are the cream of the crop, so we always have exceedingly high expectations when a new burner is rolled out. Imagine our shock, then, when the drive that we just assumed would kick some CD-R butt in the Lab actually produced benchmark scores that were a tad *lower* than most of the 12x drives we've reviewed previously.

We can only report the facts. This drive trailed other 12x IDE drives in almost every benchmark category, including the one area where Plextor typically dominates—digital audio extraction. Its timed score of two minutes and 42 seconds to rip 340MB of audio was 35 seconds behind the score of the 12x IDE Plextor drive, and 41 seconds slower than TDK's IDE drive. The bad news continued in CD-creation tests. The Plextor burned a 650MB CD in six minutes and 42 seconds, which was almost 30 seconds slower than the Ricoh combo drive, but only nine seconds slower than the IDE Plextor drive. Admittedly, these are small differences, but isn't SCSI supposed to dominate IDE, not vice versa? Apparently, times have changed.

On a more positive note, there is absolutely no doubt that this is the best drive to buy if you're already running SCSI. Its 12x recording speed was present in the former iteration of this drive, the 12/4/32 reviewed in July 2000, but the big improvement in this revision is the increased rewritable speed (from 4x to 10x) and the addition of Burn Proof technology to eliminate buffer underruns. Although we've already tested drives with Burn Proof and found the technology to be the bee's knees, we tested it even more rigorously with the 12/10/32S. It passed our arduous "copying files to the hard drive while burning a CD from the same hard drive" test with flying colors. For long stints, the drive's buffer hovered between 1- and 10-percent capacities, yet the drive produced a perfect burn every time. Did we mention that we love Burn Proof?

We experienced one anomaly in testing that seems to stem from the bundled *Easy CD Creator* CD-mastering application. During disc-to-disc, on-the-fly mixed-mode CD copying (say that 10 times fast!), the program would hang just as the burn was at 100 percent, locking up the entire system. We saw this with the Yamaha drive as well, which also uses Adaptec software. Interestingly, after we rebooted the system and retrieved the freshly burned CD, we found it to be totally functional, so this problem is more of a nuisance than a situation that hinders normal usage. We also experienced random Windows error messages on several occasions. To remedy these issues we tried updating *Easy CD Creator*, but the version that ships with this drive is the most recent, so an update wasn't possible. A future patch will hopefully address this issue.

Overall, this drive performed somewhat impressively. We think Plextor should include MP3 encoding software, and we'd like to see it ditch *Easy CD Creator* for a more trouble-free and feature-laden application, such as *Nero 5*. However, if you must have the best SCSI CD-RW drive, the 12/10/32S is a solid choice.

—Josh Norem

Plextor's 12x SCSI drive is the best SCSI CD-RW drive, but slower than some IDE drives.

YAMAHA PLUSES
- Benchmark breaker
- Almost 40x maximum digital audio extraction

MINUSES
- Buffer underrun scheme doesn't work well
- Too sensitive to differences in media
- Loud operation
- Specs are misleading
- Very pricey

PLEXTOR PLUSES
- Burn Proof
- High quality digital audio extraction
- *CDRes-Q* backup software included

MINUSES
- Slower than other 12x drives
- No MP3 software
- Problems with *Easy CD Creator*

RICOH MP1920A — 9
$350 | Ricoh
www.ricoh-usa.com
877.742.6479

YAMAHA CDW2100EZ — 4
$400 | Yamaha
www.yamaha.com
714.522.9011

PLEXTOR 12/10/32S — 9
$350 (internal), $450 (external)
Plextor | www.plextor.com
800.886.3935

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Joystick Jubilee

A STICK FOR ANY BUDGET

Joysticks have hit rock-bottom prices, so there's no reason for a budding Maverick to be flying with a mouse and keyboard. But price drops aside, some sticks rock while others suck. Here's a look at the good, the middling, and the ugly.

Microsoft

PLUSES
- Powerful, realistic force feedback
- No power brick
- USB
- Good for lefties

MINUSES
- Non-MS games require extensive configuration

Logitech

PLUSES
- Great for lefties
- Good price
- USB

MINUSES
- Force feedback effects are believable but weak
- MS games require extensive configuration

Thrust-master

PLUSES
- Cheap
- Dual output options
- Adjustable springiness

MINUSES
- Obscene button placement
- Seriously, the button placement sucks
- Fox 2 button cover is really lame

Microsoft Sidewinder Force Feedback 2

As the successor to the original Sidewinder Force Feedback, the Microsoft Sidewinder Force Feedback 2 didn't disappoint us. With a large, heavy base, the FF2 is the largest stick we've looked at lately and has a grip that should accommodate both small and medium-sized hands. Revisions include a closed joint at the base of the stick, which fixes the annoying grease leakage of the original stick, and an integrated power supply, so you can kiss the unsightly power brick goodbye. The new button layout is friendlier to lefties, although the stick's shape still favors the non-sinister masses. The FF2 also uses a USB interface, as all good joysticks should.

The force effects of the FF2 feel a little weaker than those of the original, but are still convincing. We like the added stability that the integrated power supply adds to the stick's base. Overall, the Sidewinder Force Feedback 2 is a great stick, with realistic, powerful FF effects that add to gameplay, rather than detract from it.

Logitech Wingman Force 3D

If you're looking for force feedback and don't want to spend $100, the Logitech Wingman Force 3D is for you. Although it's a tad light, the Force 3D manages to produce believable FF effects; they just aren't the most powerful we've ever felt. Of course, subtle effects are preferable to super-powerful effects. One gripe about the Force 3D is that it doesn't include a sensor that determines when you've released the stick. If you release the stick when it's not in its default position, it will gyrate back and forth indefinitely, instead of simply disabling FF effects.

We like the button layout on this joystick better than any of the other sticks in this roundup. Even though this stick is big enough for large hands, the buttons and hat switch are easily accessible without having to disjoint your thumb. The Logitech stick is also the best stick in our roundup for lefties, as the button placement is very usable with either hand.

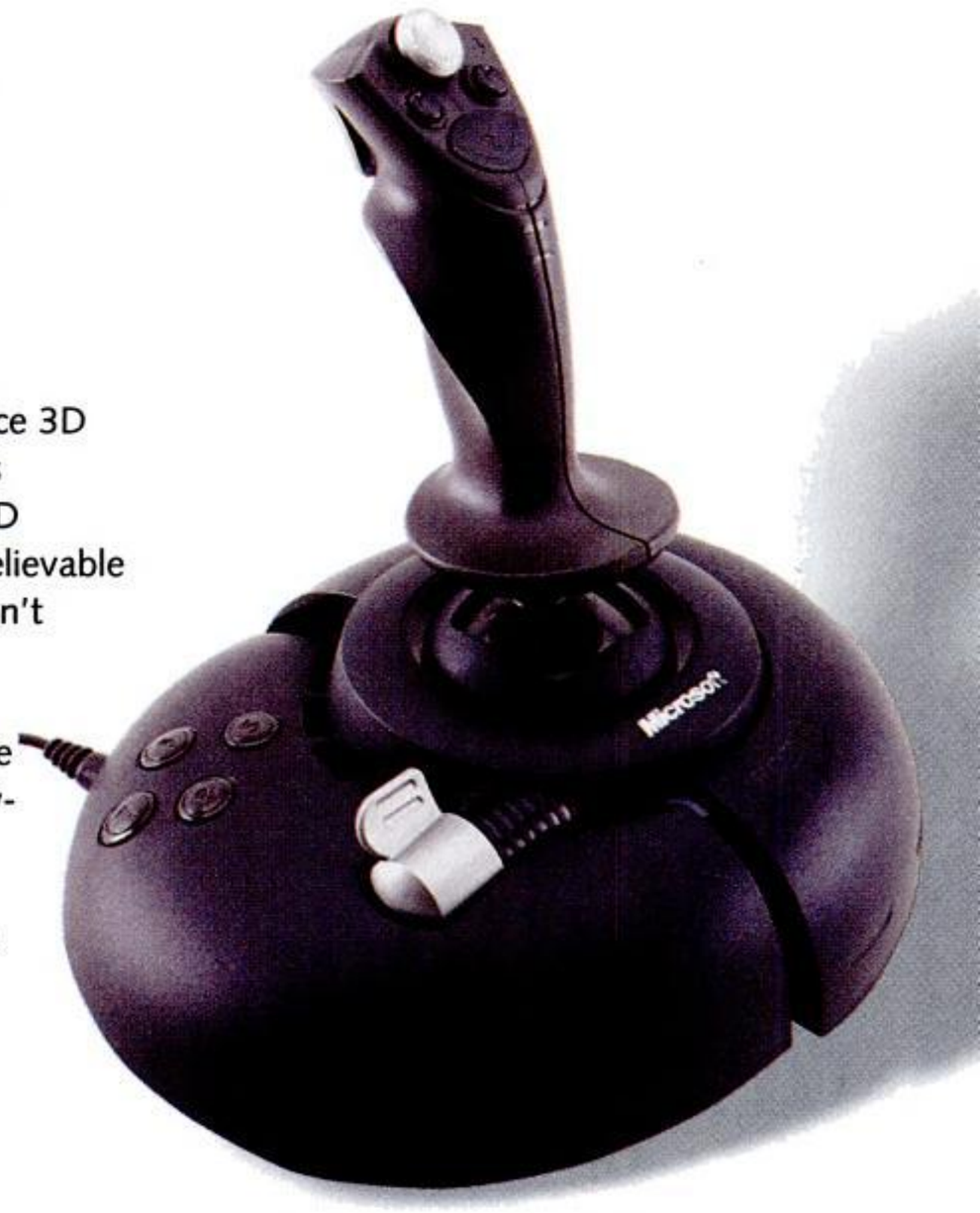
Thrustmaster Top Gun Fox 2 Pro

The Thrustmaster Top Gun Fox 2 Pro is a standard (non-force feedback) stick that blasphemes its noble lineage. In the past, Thrustmaster made awesome replicas of actual fighter sticks. Unfortunately, the company dropped the ball with the Fox 2 Pro. It has all the basic requirements of a decent non-FF joystick, but the finger-crippling button placement is atrocious. Who the hell thought that putting the #2 button on the front of the stick, above the trigger, was a good idea? If that weren't enough, the Fox 2 Pro's only noteworthy feature is the "realistic masked Fox 2 button"—noteworthy because the "mask" covering the Fox 2 button is the lamest, most annoying feature we've seen on a joystick.

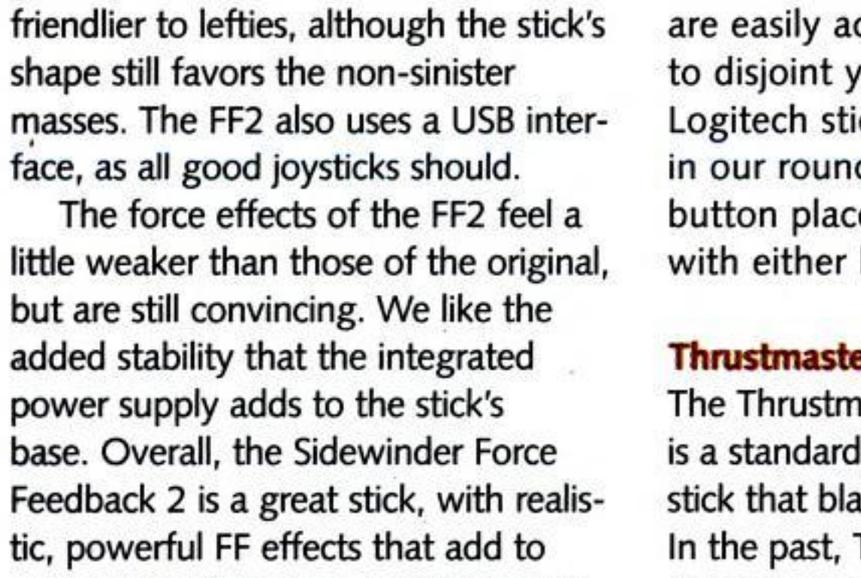
The stick shape is terrific for medium-sized right-handers. Lefties and small- and large-handed people, however, should run screaming from this stick. The aforementioned #2 button is completely inaccessible to left-handers, and any attempt to use this stick with your left hand could possibly leave you crippled for life.

The Fox 2 Pro is one of the few remaining sticks that support the old joystick ports on soundcards. Unfortunately, if you want a stick for an older pre-USB computer, this is one of your only choices.

—Will Smith



The Sidewinder Force Feedback 2 delivers consistent, powerful force feedback, and its extra-porky base is terrific.



The Logitech Wingman Force 3D (left) is a great deal, delivering unobtrusive force feedback without a big pricetag. On the other hand, Thrustmaster Top Gun Fox 2 Pro (right) lacks force feedback and is crippled by asinine button layout.

MICROSOFT SIDEWINDER 9
$110 | Microsoft
www.microsoft.com | 800.426.9400

LOGITECH WINGMAN FORCE 7
$60 | Logitech
www.logitech.com | 800.231.7717

THRUSTMASTER FOX 2 PRO 3
$40 | Thrustmaster
www.thrustmaster.com | 877.484.5536

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EIZO FlexScan L671

THIS DVI FLAT-PANEL FALLS JUST SHORT OF KICK ASS

In the exclusive world of LCD flat-panels, the Apple Cinema Display sits on a plateau of its own. It offers unparalleled screen real estate, resolution, and image quality, and that's why we gave it a Perfect 10 verdict in the December 2000 issue. But how do more plebeian panels compare to Apple's proof-of-concept? What *can* you get for around $1,100 less? Well, you can't get a Perfect 10, but you can certainly get a panel that tops anything that was on sale 18 months ago. Case in point: The EIZO FlexScan L671, the first flat-panel with a DVI connector to find its way into the Lab.

DVI (that's shorthand for digital visual interface) grants LCD displays a pure digital signal in order to stave off any video noise that might result from analog-to-digital conversion. Plenty of other panels ship with competing digital interfaces—we've reviewed four of them in the past—but DVI is the spec with the best shot for widespread industry support. If DVI takes off as expected, we might finally see an end to all the competing "standards" that have locked us into proprietary madness and limited our videocard upgrading choices. As it stands now, a nice assortment of vendors are shipping videocards with DVI output. In fact, we used a GeForce2 MX card to test this EIZO panel. Cards from ATI and Hercules currently ship with DVI connectors, and Matrox should ship DVI-ready cards in due time.

With an 18.1-inch diagonal screen size and 1280x1024 natural resolution, the L671 falls into the largest class of "conventional" LCD displays—if you want larger sizes, you'll have to buy the other-worldly SGI 1600SW or Apple Cinema Display. During *DisplayMate* testing, the L671 demonstrated excellent screen uniformity; the dreaded darkening-around-the-edges effect only reared its head when screen brightness was at a minimum. And while grayscale reproduction was excellent insomuch as the monitor was able to resolve the subtle variations among a slate of gray values, we did see a nasty "tearing" effect between two different values when the monitor was running off its DVI connector—sparkly purple pixels shimmered between the two gray bars. Oddly enough, the tearing didn't appear when running the L671 off its 15-pin analog connector.

The EIZO L671 is just a few pixels shy of Kick Ass.

Aside from the strange purple line, the panel exhibited absolutely no video noise when running off DVI, and only a marginal, almost imperceptible amount when running off analog. Colors were bright, lavish, and true to the 24-bit spec in both modes, but text reproduction degraded into blurry crap in type smaller than 6.8 point. We were surprised that puny text looked so fuzzy. It almost appeared as if the L671 was fine-tuned for 6.8 type to the detriment of any smaller type.

Because all LCD displays have a fixed grid of pixels, they only run at one "natural" resolution. If you set the monitor for a resolution that's lower than the natural resolution, the monitor will use algorithms to interpolate the screen image. The result is typically a blurry, artifacted approximation of what the screen should actually look like. The L671's interpolation algorithms are relatively adept, but, even better, if you don't like the interpolation mode, you can opt for a "normal" mode that retains pixel accuracy and centers the lower resolution in just a portion of the entire screen (the gray bar that surrounds the actual display area can be adjusted from white to black). For even more fine tuning, interpolated resolutions can be adjusted with an incremental "smoothing" control, as well as a control that lets you bump your display resolution up and down in single-pixel increments.

The L671 includes four downstream USB ports, comes in black or gray, and can be mounted on the wall. It may not be the best LCD flat-panel available, but it includes enough forward-thinking features to put EIZO squarely in the game.

—Jon Phillips

PLUSES
- DVI
- Large screen and resolution
- Good colors and grayscaling
- Nice controls for fine-tuning

MINUSES
- Strange "tearing" effect
- Inconsistent text reproduction
- Not in same league with LCD elite

THE SPECS

SCREEN SIZE
18.1-inch diagonal

NATURAL RES
1280x1024

COLOR DEPTH
24-bit

USB
Four downstream ports

INTERFACE
DVI (version 1.0) and 15-pin D-SUB

SIZE
16.9x17.9x8.6 inches (WxHxD)

WEIGHT
19.2 lbs

MAXIMUM PC VERDICT 8

$2,900 | EIZO | www.eizo.com
800-800-5202

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Multi-Gig MP3 Players

GIGABYTES ON THE GO

Until now, owners of portable MP3 players have pinned their greatest hopes on one thing: getting ahold of more SmartMedia. Enter Creative Labs' Nomad Jukebox and SSI's Neo 25, which set new highs in built-in storage capacity. But, unlike most portable MP3 players, these units are bigger, bulkier, and have plenty of moving parts that will definitely break if dropped.

NOMAD PLUSES
- 6GB of MP3 goodness
- Good lookin'
- Awesome EQ features

MINUSES
- Boot-up takes too long
- Can't transfer files from the player to a PC

NEO 25 PLUSES
- Drive-letter recognition
- Files can be transferred from unit to a friend's PC
- Remote control

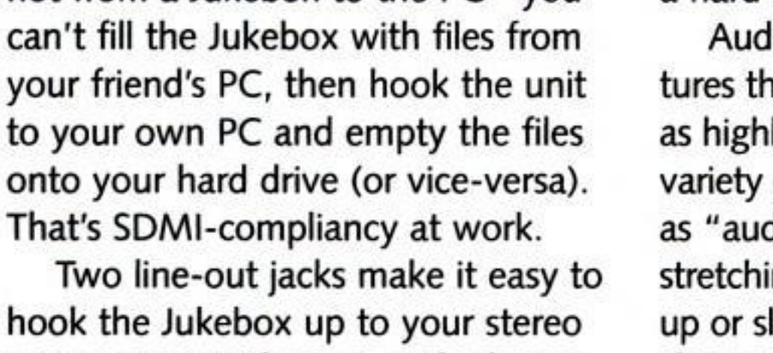
MINUSES
- Controls are quirky
- LCD is tough to read

Creative Nomad Jukebox

With 6GB of storage space, the Jukebox can hold more than 2,500 MP3s (depending on file sizes), and even more WMA files—it plays both formats out of the box, and is firmware upgradeable to support future codecs. The unit's large, backlit LCD displays about 10 lines of information.

The Jukebox comes bundled with Creative's new *PlayCenter2* software, which can be used to organize and upload music to the Jukebox and to rip, encode, and play tunes from your PC. But tunes can only be loaded from a PC to the Jukebox, not from a Jukebox to the PC—you can't fill the Jukebox with files from your friend's PC, then hook the unit to your own PC and empty the files onto your hard drive (or vice-versa). That's SDMI-compliancy at work.

Two line-out jacks make it easy to hook the Jukebox up to your stereo or car (via an adapter), and a line-in jack lets you record audio with a mic. It takes just 25 seconds to upload a 3.5MB file via the unit's USB connection. So to figure out the total time to fill the unit, multiply that number by thousands of files, since the point of the Jukebox is to store your entire MP3 collection on one portable player. A five-minute buffer keeps



SSI's Neo 25 is a hard drive...no wait, it's an MP3 player...oops, no, it's a hard drive...but now it's an MP3 player...

Creative's Nomad Jukebox looks like a portable CD player—it's fun to watch people try to open it! Ha ha!

the unit from skipping, but if you drop it, shake it, or leave it in a hot car—anything you shouldn't do to a hard drive—it probably won't last.

Audiophiles will appreciate the features that set the Jukebox apart, such as highly customizable EQ settings, a variety of environmental settings, such as "auditorium" and "cave," and time stretching, which allows you to speed up or slow down playback without changing a song's pitch.

SSI Neo 25

It may be wrapped in a case with "MP3" printed on it, but the Neo 25's manual unapologetically tells it like it is: "This product is an IDE hard drive." Simply attach the Neo 25 to your PC via its USB port and your computer sees it as an additional drive, complete with drive-letter recognition. Loading any kind of file becomes a matter of dragging and dropping. And unlike the "anti-piracy" Nomad, files can be transferred onto *and* off of the unit at will. The transfer rate is pretty speedy—we loaded 64MB in just over a minute—and if you're storing files on your PC in folders, that file structure is preserved on the unit. The device boots up and is ready to play in about 30 seconds, which is what we expect from a PC-related consumer electronics product.

The Neo 25's backlit LCD is sizeable, but displays so much information at once, it's confusing. We also found the circular dial that gives way to preset EQ settings too wiggly, so it's easy to hit the wrong button. Better to use the included remote, which is itself a nice feature.

The Neo 25's playback could have benefited from some useful EQ settings. In fact, it's in this area that the Neo 25 really falls to the Nomad, along with the fact that it offers no line-in or line-out ports, and a significantly smaller buffer. But then, the Nomad is specifically designed to act as an MP3 repository—the Neo 25 is just a hard drive masquerading as one.

—Kristen Shepos-Salvatore

NOMAD JUKEBOX 8
$500 | Creative Labs
www.nomadworld.com | 405.742.6622

NEO 25 7
$500 | SSI
www.ssiamerica.com | 403.357.1950

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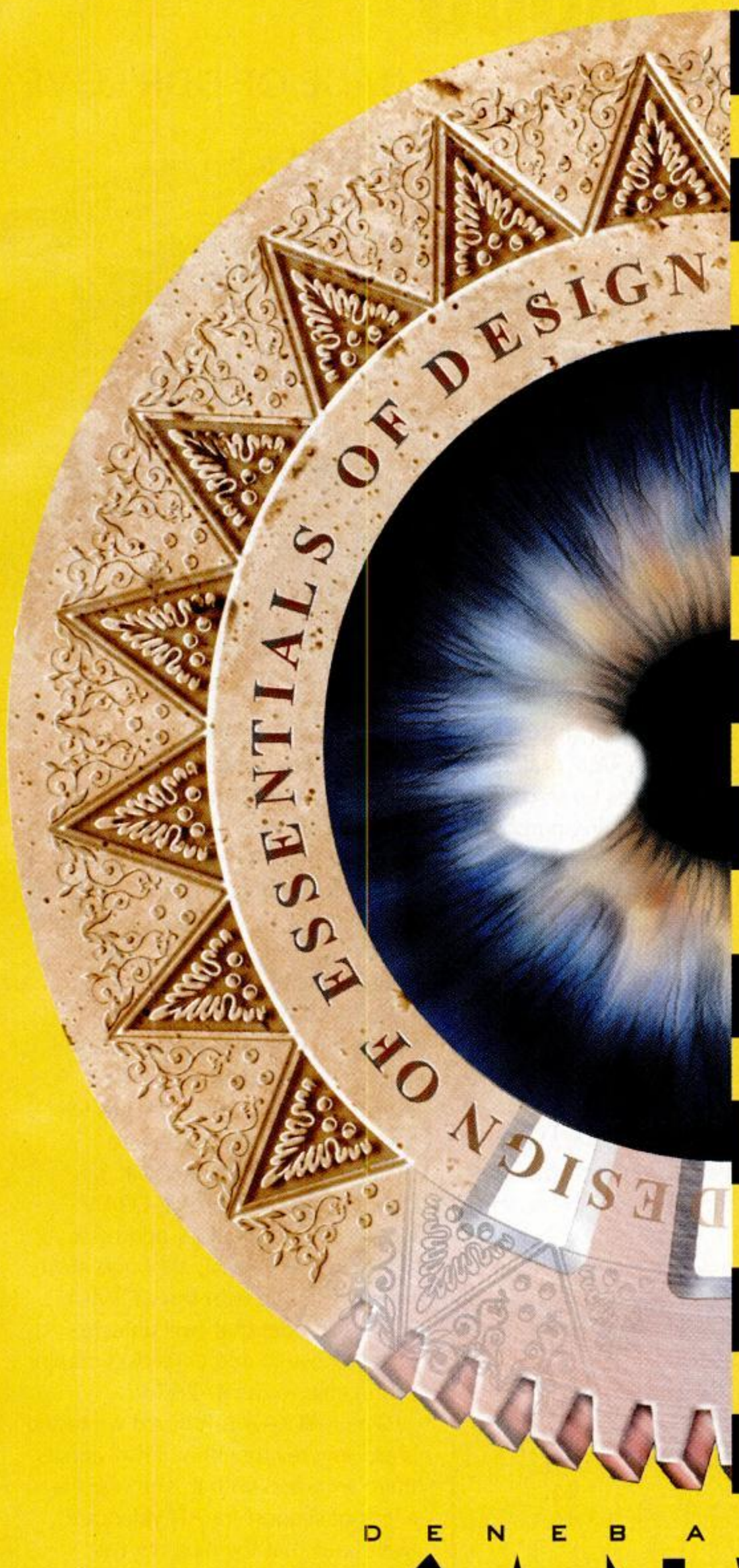
Illustration never looked so good.



Eye-catching illustration, isn't it? And yes, despite the glistening highlights, the realistic textures, the subtle shading, and the soft air-brushed effects, this is a completely vector illustration. And it's only possible with Canvas 7.

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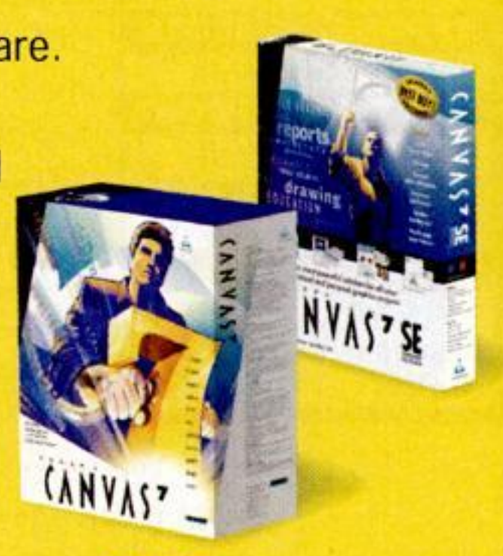

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Iwill KA266-R Mobo

NEXT-GEN ATHLON BOARD SPEAKS THE LANGUAGE OF DDR LOVE

With the Iwill KA266-R, DDR is no longer a pipe dream.

PLUSES
- DDR, baby
- Onboard RAID
- Performance makes Thunderbirds scream

MINUSES
- Crappy CMI sound chip
- Currently lacks Radeon support

THE SPECS

CHIPSET
ALi MAGiK 1

SUPPORTED PROCESSORS
AMD Thunderbird Athlon and Duron processors up to 1.2GHz

EXPANSION SLOTS
1 AGP, 5 PCI, 1 AMR

MEMORY SUPPORT
3 DIMMs for 3GB of PC1600/2100 DDR SDRAM

OTHER
AMI RAID controller supporting RAID 0, 1, and 0+1

The first DDR chipset has landed. Everyone expected VIA to come out with the first DDR chipset, but ALi beat it to the punch. Hardened upgraders will remember ALi's checkered history—the company has released crappy chipsets in the past, such as the 430TX Pro (a poor-performing imitation Intel 430TX chipset). Luckily, ALi's newest chipset doesn't continue this tradition.

The Iwill KA266-R is the first mobo to offer ALi's MAGiK 1 DDR chipset. MAGiK 1 supports Socket 462 for Thunderbird CPUs. A Socket 370 version, the Aladdin Pro 5, offers DDR to Pentium III boards.

The MAGiK 1 offers funky-fresh features such as support for PC1600 and PC2100 DDR memory (offering throughput of 1.6GB/sec and 2.1GB/sec respectively), and also for PC66/100/133 SDRAM. This allows mobo makers to offer combo boards with SDRAM and/or DDR. Please note that the Iwill KA266-R only supports DDR. The MAGiK 1 also supports ATA/100 and AGP 4x. This chipset is ready to challenge VIA's and Intel's best.

We tested the board with a single hard drive (in order to compare its numbers to another Athlon DDR system), but we also benched it with dual IBM 75GXPs in RAID 0 and found the RAID scores up to snuff.

For comparative testing purposes, we used the KA266-R as the anchor for a system that would face off against AMD's latest reference box—the same box we used in January to compare the fastest Athlon config against the fastest Pentium 4 config. This reference box uses the AMD-760 chipset, which, like the MAGiK 1, supports DDR memory.

The Athlon DDR winner? Let's call it a tie. Dominance shifted back and forth between the two DDR systems, though the Iwill rig seemed to have a bit more polish in some areas. In *Quake III* testing, the AMD-760 reference box handily defeated Iwill's board by more than 5fps. And in *SYSmark 2000*, the KA266-R lost by a six-point margin. However, *Photoshop* testing told a different story. The Iwill board edged the AMD-760 system by two seconds. In Sisoft's *Sandra* benchmarking, the ALi chipset pummeled AMD's 760 in all but the Streaming Integer test. Overall, the scores show reliable drivers, and hopefully future driver updates will offer even better performance.

Be aware that the MAGiK 1 only supports unbuffered DRAM. However, the MAGiK 1 addresses up to 3GB of DRAM, although most mobos will ship with three DIMM slots. Also note that Iwill unfortunately chose to add C-media's crappy sound chip to the KA266-R.

The Iwill KA266-R board we tested is an early rev (rev B) and Iwill admits there are issues with it. The worst is a lack of support for ATI videocards. Iwill states that the next rev will address this shortcoming.

With its roster of features, Iwill's KA266-R is the ticket to a new world of ultra-fast memory. Just hop on board and leave bandwidth bottlenecks behind.

—Scott Tarr

BENCHMARKS	AMD-760 DDR REFERENCE SYSTEM	IWILL KA266-R	1.5GHZ PENTIUM 4
Quake III 640x480 (sound disabled)			
Normal3	175.4fps	170.0fps	**209.5fps**
3DMark 2000			
VideoMark	32.4fps	30.83fps	**37.6fps**
SiSoft *Sandra* CPU	565	561	**1552**
SiSoft *Sandra* FPU	679	789	**1584**
SiSoft *Sandra* Drystone	3331	**3352**	2839
SiSoft *Sandra* Whetstone	1665	**1675**	887
SysMark 2000 Windows Media Encoder	48.28 secs.	50.62 secs.	**33.35 secs.**
SysMark 2000 Overall	**236**	230	199
Photoshop 5.5	104 secs.	**102 secs.**	117 secs.
HD Tach 2.61	N/A	37.5MB/sec	N/A

Notes: All systems used 7,200rpm IBM Deskstar, Windows 98SE, and GeForce2 Ultra. The Pentium 4 used a 1.5GHz Pentium 4, i850 motherboard, and 256MB of PC800 RDRAM. The AMD-based systems used AMD 1.2GHz Thunderbird, 256MB of PC2100 DDR SDRAM, and DX7 plus AMD DLL. The KA266-R system also used ALi's 1.72 AGP drivers. HD Tach was tested in RAID 0 with two striped drives. Best scores bolded.

IWILL KA266-R **9**

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www.iwillusa.com
949.753.5488

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Digi-Cam Three-Way

PRO FEATURES TRICKLE DOWN TO CONSUMER-GRADE CAMERAS

HP

PLUSES
- Easy to use
- Some manual controls
- 30-bit color depth
- Self-closing lens cover

MINUSES
- White balance is off
- Macro mode is weak

NIKON

PLUSES
- Best picture quality
- Split-shell case design lets you capture tricky shots
- Full manual control

MINUSES
- Digital zoom still isn't great
- Case takes getting used to

Most people crave the ultra-high resolutions and advanced features offered in pro-level digital cameras, even if they simply want to shoot pics of their kids playing in the park. To this end, we've collected a trio of cameras that offer high-end technology without heart-stopping price tags. Join us as we take a look through the lenses of a 2.1 megapixel bargain from HP and two $1,000 3.3-megapixel models from Nikon and Epson. (The term megapixel signifies one million pixels. So, for example, a 1.9-megapixel camera can offer image resolutions up to 1600x1200 in a 4:3 aspect ratio.)

HP's PhotoSmart C618 may be the cheapy in this group, but it's insanely easy to use and instantly gratifying.

Hewlett-Packard PhotoSmart C618

The HP PhotoSmart C618 is the most moderately priced (and configured) camera in this roundup. It offers a respectable 2.1-megapixel CCD and has options for manual focus, white balance, and ISO speed—nice features for what is essentially a point-and-shoot camera. It also has a roomy two-inch LCD, minimal shutter lag so you can snap spontaneous shots, and enough flash settings to compensate for any dodgy lighting conditions. For the price, the C618 is an excellent camera that should be more than sufficient for amateur shutterbugs.

The camera's most welcome feature is its easy-to-use, ergonomic design. Fingers don't get in the way of the flash or the lens, and all the frequently used controls—such as the shutter release and the zoom—are within easy reach. Obviously, HP wanted simplicity to be this camera's defining feature.

High-quality snaps are the result of a precision Pentax lens and a custom ASIC that optimizes captured images. The camera can also achieve 30-bit color—a color depth that usually doesn't find its way into budget cameras. The digital zoom is garbage (as is the case with almost all digital zooms), and the Macro setting, while a nice feature, is geared toward the hobbyist and won't suffice for anyone who needs pro-level close-ups.

The darkest mark on the camera's record is its sensitivity to varied lighting conditions. While the C618 offers tungsten and fluorescent lamp white-balance compensation to mitigate the harsh effects of these lights on skin tones, the feature leaves a lot to be desired; skin tones under these lighting conditions had a tendency to look washed out and overexposed. If you're going to shoot portraits, perfect your own lighting or take the camera outside—this camera is definitely more natural-light friendly.

Snappy amenities such as a remote control for self-timed shots and an infrared sensor for transferring pics to either a printer or another camera sweeten the deal. There's also a diopter adjustment knob and a self-sealing lens cover, so you don't have to worry about losing a lens cap.

The C618 may not offer the full complement of possible features, but it still has features up the wazoo and takes smart enough pictures to serve as a worthy starter camera for ambitious newbies.

THE SPECS

HP

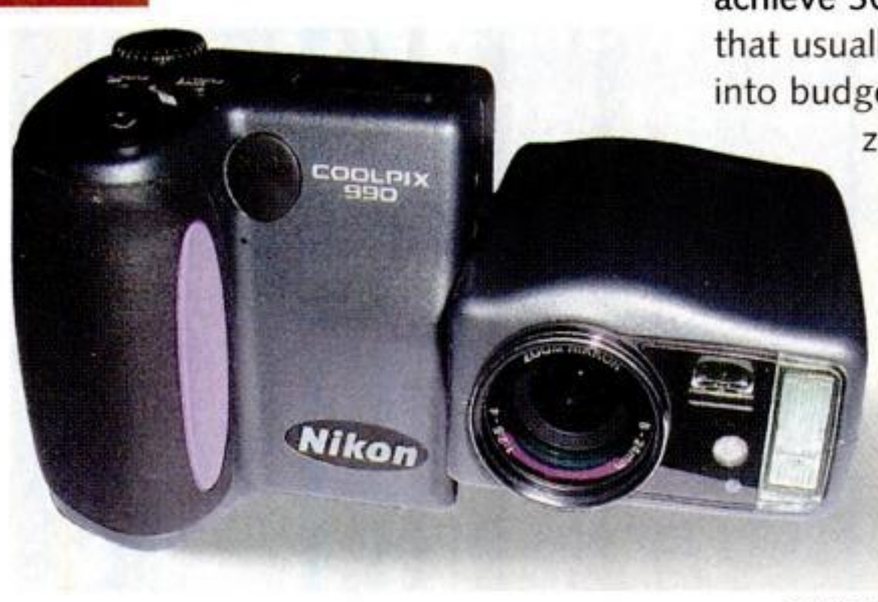
WEIGHT
0.80 pounds

SENSOR
1/2.7", 2.11-megapixel CCD

RESOLUTION
1600x1200 pixels (full)

ZOOM
3x optical/2x digital

FILE FORMATS
TIF and compressed JPEG



Whether you're just snapping pics or looking for a prosumer camera, the odd looking Nikon CoolPix 990 is the sturdy bridge between both worlds.

Nikon CoolPix 990

It's no surprise that the only camera in this roundup that's made by an actual camera manufacturer (as opposed to a PC-peripheral company) has the best overall picture quality. What is surprising, however, is that the Nikon

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is jam-packed with professional-level controls in a very small chassis and still costs just $1,000.

The CoolPix is rather minuscule compared to its competitors, and its radically different case design takes some getting used to. After an acclimation period, however, you'll realize that the split-shell design is actually ingenious, allowing you to position the lens at any angle using the swivel base (great for hard-to-reach shots), while still keeping your LCD viewfinder right in front of you. Another notable design feature is immediately obvious when you pick up the camera for the first time: The 990 boasts a solid heft that instantly erases any chintzy, toy-camera preconceptions.

Crystal clear pictures come from Nikon's famous Nikor lens. It offers a 3x optical zoom, a halfway decent 4x digital zoom, and a 3.34-megapixel CCD for 2048x1536 resolutions. Not enough for ya? It also features a proprietary matrix metering system that reads 256 different segments of the incoming image and adjusts white balance accordingly for more accurate color reproduction. And with five manual settings for various kinds of lighting conditions (even incandescent), you can compensate for just about any lighting condition on the planet.

The CoolPix also includes a five-area multi-focus feature for setting up shots in a frame. The feature lets you focus in on whatever is in the center of the frame or in any of the four corners, letting you snap off shots with different focal points. There are also different shooting modes, including a straightforward autofocus for easy point-and-shoot, a single-focus mode that doesn't zero in on an image until the shutter is depressed halfway, and a continuous-focus mode that will update focus information to the LCD screen as you swivel the lens for the proper shot. All focus, exposure, and white balance settings on the CoolPix 990 can be tweaked manually for a wide range of artistic interpretation.

With a shutter release speed of 1/10 of a second, a dazzling Macro mode that can focus on an object only 1/8 of an inch away, a flash that acts as a built-in speedlight with an option for an attachable external speedlight, and the option of switching out lenses in favor of telephoto or wide-angle lenses, the Nikon CoolPix is a damned slick camera with a lot to offer. The space that separates hobbyists from pros can be easily filled by the CoolPix 990.

The Epson may be second to the Nikon in image quality, but its rugged design, comfort, and ease of use offer stellar all-around functionality.

Epson PhotoPC 3000Z

In the past we've gone gaga over printers and scanners from Epson, but we were skeptical when reps from the company wanted us to check out Epson's PhotoPC digital camera. Well, all skepticism was laid to rest after seeing the stunning performance of the newest iteration of the PhotoPC line. Easy to use and loaded to the gills with pro features, stunning color reproduction, and a level of expandability you just don't find on most consumer-level cameras, the PhotoPC 3000Z blew our freaking minds.

The camera pumps out vibrant, high-quality photos at high resolutions, thanks to the 3.34-megapixel CCD, the Epson lens, proprietary color management, and a white balance second only to that of the Nikon. Please be warned: Epson's marketing gimmick for its line of cameras is the "HyPict" setting that uses interpolation to bump up the standard 3.3-megapixel resolution from 2048x1536 (saved in uncompressed TIF format) to a gaudy and not entirely legitimate 2544x1904. The feature is nice in that it stretches the limitations of the physical CCD, but it's the same trick scanners use, and artifacting is apparent in the HyPict setting, especially when images are printed.

Marketing devices aside, the 3000Z fits perfectly into the hand with the same kind of heft as the Nikon. The chassis is designed to look and operate like a traditional SLR camera, and the 3000Z is so ergo, you'll feel like you've been using it for years after only a few pictures. Picture quality, flash, and self-timer buttons are right on top of the camera and set to the right of a handy display that shows you how many pictures you have left, white balance info, and remaining battery life, among other vital stats.

The optical viewfinder is designed for real image acquisition, unlike the LCD panel that tends to cut off the tops of pictures. A jog dial gives you three distinct shooting modes for automatic focus snapshots, macro and manually exposed shots, and video clips or interval shooting.

The icing on the chalupa is the inclusion of rechargeable batteries (with charger), expandability for lenses and filter attachments, and a hot shoe for an external flash.

The Epson may bow to the Nikon in final image quality, but it wins the prize for best all-around functionality and performance.

—Geoffrey Visgilio

EPSON

PLUSES
- Ergonomically splendid
- Excellent picture quality
- Expandability
- Rechargeable batteries

MINUSES
- HyPict interpolation is bogus
- Shutter release time could be better

THE SPECS

NIKON

WEIGHT
1.15 pounds

SENSOR
1/1.8", 3.34-megapixel CCD

RESOLUTION
2048x1536 pixels

ZOOM
3x optical/4x digital

FILE FORMATS
TIF and compressed JPEG

THE SPECS

EPSON

WEIGHT
0.90 pounds

SENSOR
1/1", 3.34-megapixel CCD

RESOLUTION
2544x1904 pixels

ZOOM
3x optical/2x digital

FILE FORMATS
TIF and compressed JPEG

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$600 | Hewlett-Packard
http://welcome.hp.com | 888.999.4747

NIKON COOLPIX 990 — 9
$1,000 | Nikon
www.nikonusa.com | 800.645.6689

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Mice With Cameras

FINALLY, OPTICAL POINTING DEVICES THAT DON'T SUCK

Logitech and Microsoft have squared off once again to see which company delivers the best optical pointing devices. Logitech's offerings include iFeel force feedback technology, and Microsoft chimes in with optical trackballs that combine the shape and features of a standard mouse for improved efficiency.

Microsoft's new trackballs combine a standard mouse and an optical trackball—two great ideas that work well together.

Microsoft Trackball Explorer/ Trackball Optical

We've slammed Microsoft's optical offerings in the past, but we're downright giddy over these optical trackballs. For testing, several different staffers used them as their desktop mice for a few weeks. The verdicts were unanimous—these trackballs are the best we've ever used.

But wait, don't these trackballs use the same wack-ass optical technology that we've griped about before? Yes and no. The optical technology is indeed similar in design, using a teeny camera to snap pictures of the mousing surface to track movement. But the tech in these trackballs allows for 2,000 images per second, whereas previous Microsoft optical mice snapped only 1,500 images per second. The improvement is noticeable, too, as these trackballs provide seemingly flawless accuracy.

The coolest thing about these trackballs isn't the software—which is the same *Intellipoint* package used since the dawn of time—but the extra buttons provided. In addition to the standard mouse1 and mouse2 buttons, there are a scroll wheel (hallelujah!) and two small programmable buttons that can scroll web pages or handle an assortment of tasks. Our only complaint with these trackballs is their massive size, which requires a full-hand grasp.

Still, these trackballs have converted a few staffers. If you're suffering from RSI or just want to ditch your standard mouse, these Microsoft trackballs could be the answer to your prayers.

Logitech iFeel mice

The first force feedback mouse we reviewed from Logitech (Dec 99) came bolted to a plastic tray that held an internal motor for force feedback, and we hated it. Fortunately, the iFeel mice (both regular Mouse and Mouseman) address many of the complaints we had with that initial bizarre contraption, but they're not totally without quirks.

The force feedback has been reduced from "palm shaking" to simple vibration, which is a-ok with us, considering how pointless force feedback is for a mouse. The vibrations can be infinitely tweaked, ranging in strength from "none" to a palpable "click."

Logitech's iFeel mice are very comfortable and let you feel your desktop. Sadly they don't let you "feel" porn sites—yet.

The *Immersion Desktop* software allows you to feel physical sensations when the mouse is rolling over menus, desktop icons, and the like. The subtle vibrations are created along the mouse's Z-axis by calculating and translating the wave form of a sensation.

The only problem is, feeling a click when moving your mouse over an icon isn't exactly a life-changing experience—in fact, most staffers were annoyed by it. Interestingly, the subtle force feedback can be used in some games. Support is currently offered for a handful of titles—*Soldier of Fortune*, *MDK2*, *Gruntz*, *Half-Life* (no mods are supported), *Slave Zero*, *Nocturne*, *Battlezone II*, *GLQuake*, *Shogo*, and *Heavy Gear II*. Of these, we were only able to test with *MDK2*, and the results were impressive. Each footstep results in a light tap on the wheel, adding a new level of immersion to an already immersive title.

Even without iFeel technology, these Logitech mice are the most ergonomic optical mice we've ever used. We're pretty impressed.

—Josh Norem

MICROSOFT PLUSES
- Scroll wheels
- Comfortable design
- Excellent tracking

MINUSES
- Excessive girth

LOGITECH PLUSES
- Comfortable design
- Iridescent sheen is cool
- iFeel not too annoying

MINUSES
- Limited support for games
- iFeel isn't *that* great

MICROSOFT TRACKBALLS — 9

$75 (Explorer, grey), $45 (Optical, black) | Microsoft
www.microsoft.com
800.426.9400

LOGITECH — 8

$40 (Mouse), $60 (Mouseman) | Logitech
www.logitech.com
888.863.8312

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Adobe Photoshop 6.0

THE *FIREWORKS* KILLER HAS ARRIVED

Adobe *Photoshop* has always been the de facto image editing app for print production, but not for web work (although version 5.5 was a step in that direction). For Internet graphics, pros have always favored Macromedia *Fireworks*, thanks to its web-friendly image optimization controls. Adobe aims to change all that with the latest rev of *Photoshop*, and, in our opinion, the graphics warhorse hits the nail on the head.

PLUSES

- Vector graphic tools are top-notch
- *Image Ready 3.0* is a powerful addition
- Text enhancement options are amazing

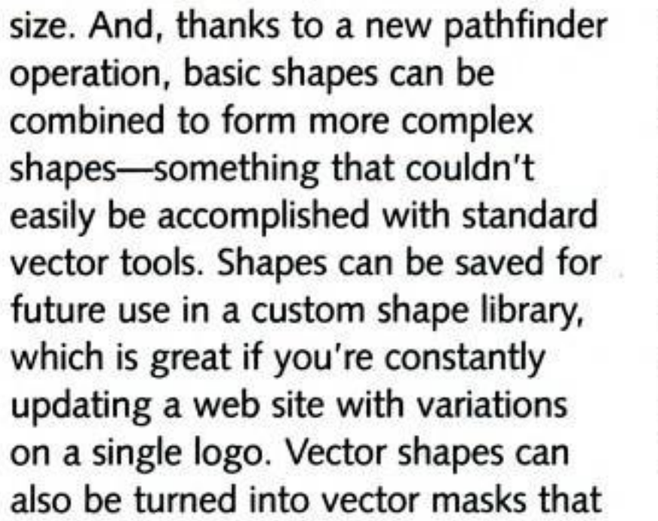
MINUSES

- Not worth the upgrade if you don't do web work
- *Illustrator* is required for serious vector work

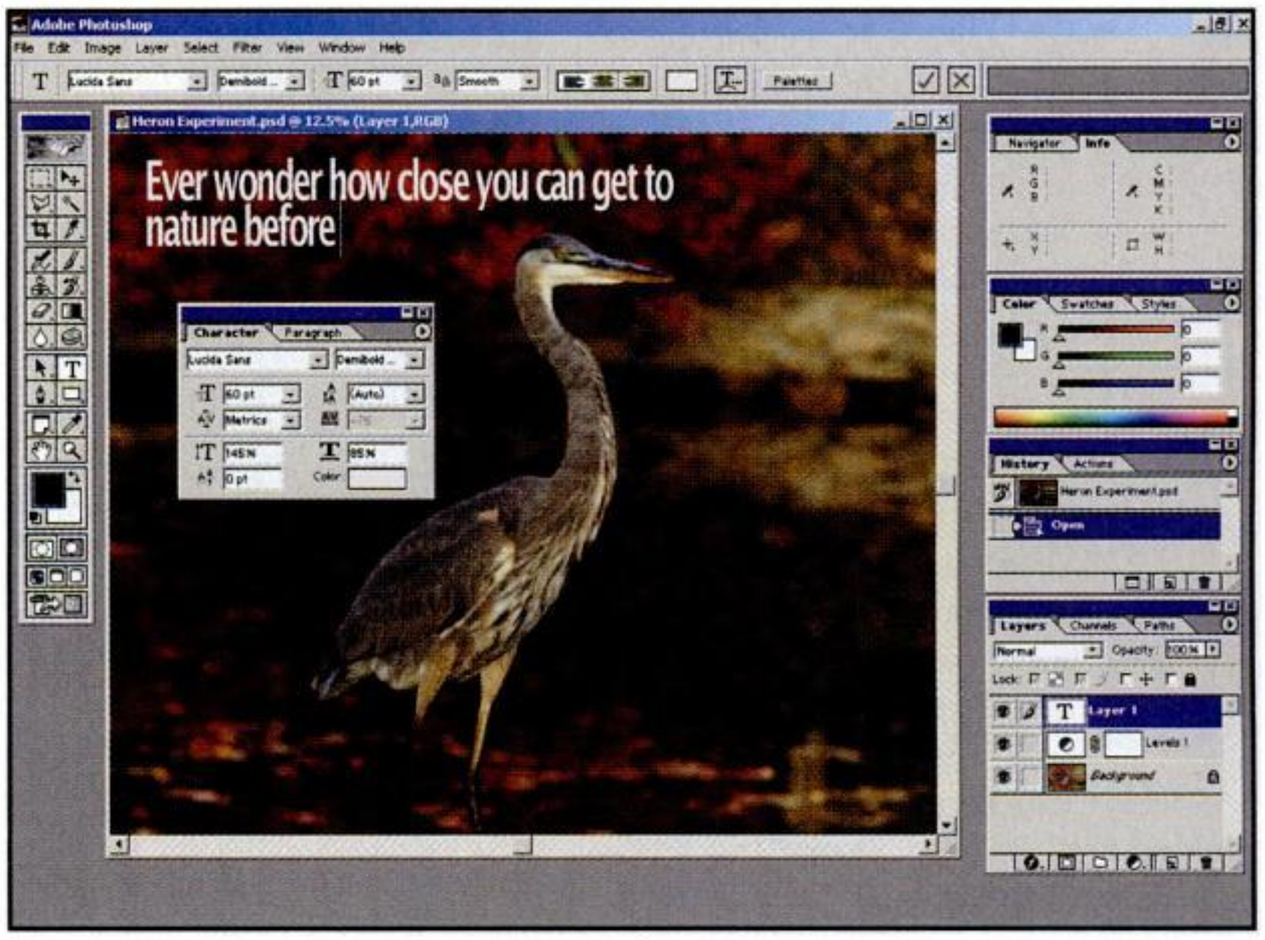
While print folk will hardly notice anything new in version 6.0, web monkeys will appreciate a slew of new vector image controls, which augment *Photoshop*'s traditional complement of raster controls. The new tools have always been available in programs such as *Illustrator* and *Freehand*, but now you don't need to leave *Photoshop* to get all your work done.

New vector-drawing tools let you make resolution-independent shapes that don't pixilate when blown up in size. And, thanks to a new pathfinder operation, basic shapes can be combined to form more complex shapes—something that couldn't easily be accomplished with standard vector tools. Shapes can be saved for future use in a custom shape library, which is great if you're constantly updating a web site with variations on a single logo. Vector shapes can also be turned into vector masks that can be clipped out of an image and filled with a number of new gradients and pattern fills for some really cool effects. This is indeed a welcome departure from the traditional bland palette of web-safe colors.

Layer styles—introduced in version 5.0 to add effects such as drop shadows, embossing, and glows to layers—have been enhanced with a new interface. Effect choices are as simple as checking a box and fine-tuning with sliders for more precise instructions, such as opacity and angles. And the best part is that layer effects now support larger sizes so you can work with shots taken at higher resolutions.



The new Liquify filter lets you distort sections of an existing image for truly surreal effects.



This *Fireworks* killer offers a superb union of text and rasterization tools.

And while most layout programs support vector shapes, *Photoshop 6.0* goes one awesome step further to allow on-canvas text entry. That's right—Adobe has finally done away with that awful bounding box! Now you can enter text on the page on the fly, while a docking tab set off to the side lets you fool with font, color, size, and kerning options.

The coup de grace is the inclusion of *ImageReady 3.0*, a web/photo optimization tool. Originally sold on its own and now bundled with *Photoshop*, *ImageReady* has some absolutely excellent features, including the ability to switch between applications with a push of a button and use rollover styles for effortless creation of button rollovers and slicing options. Furthermore, image compression options have been beefed up to allow for perfect optimization of your final images for the web.

For photo editing, users are greeted with a familiar but much more user-friendly interface. The most noteworthy addition is a context-sensitive toolbar that displays the properties of the tools that are most commonly used. Layer fanatics will love the new content layers in version 6.0, as they can now choose between adjustment or fill layers to tweak properties such as levels and curves without altering the original image underneath. And now you can switch back and forth between these layers without having to delete one in favor of the other.

For image editors, an upgrade to *Photoshop 6.0* isn't really worthwhile if you're currently using version 5.0 or higher—aside from a few interface and feature enhancements, not a lot has changed. Version 6.0 is, however, a web-driven juggernaut, and if you're looking for a *Fireworks* killer, *Photoshop 6.0* is guilty as charged.

—Geoffrey Visgilio

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Sacrifice

AWE-INSPIRING GRAPHICS, LAMENTABLE STORY

Shiny has revitalized the third-person, realtime strategy genre with *Sacrifice*, an RTS with a dash of role playing that's unlike anything we've seen before. In addition to twists on gameplay, *Sacrifice* also offers the most stunning visuals we've ever seen in a PC game. The only caveat in this combination is the requirement of heavy-duty hardware and, of course, the fact that a new type of game isn't necessarily a winner unless it's fun. Unfortunately, *Sacrifice* is more frustrating than fascinating.

Your more powerful spells can create thunderstorms, tornados, walls of fire, and rip holes through the earth.

Gameplay

In *Sacrifice*, you play a rogue priest who enters a world controlled by five very different gods. At the start of each mission, some or all of the gods pitch different missions to you. You have to decide which mission to choose and, as a result of that choice, which god you stand behind.

The contest between good and evil takes place in battles with enemy priests in areas controlled by different gods. Upon your arrival in a new area, you capture resources and conjure up an army to decimate the enemy. Your implements of destruction include a whole host of units and spells.

Shiny's decision to go third-person certainly allows you to appreciate the otherworldly graphics, but makes controlling your minions unnecessarily difficult since you can't see the entire battlefield (a requirement for RTS games). The challenge of strategy games should be figuring out how to defeat your enemy, not figuring out how to select your troops.

Don't let the pretty graphics fool you—this is an advanced strategy game. After progressing through the first few levels, it becomes almost impossible to succeed unless you've bound keys for all your spells (inexplicably, you aren't able to bind some frequently used spells to hotkeys).

On a positive note, we're very impressed with the number and variety of units, such as trolls and druids, in *Sacrifice*. The units, as well as offensive and defensive spells, are dependent on the god you choose to follow on each mission. This allows you to play with any of five different sets of units and spells as you progress through the game.

Persistent widgets, such as blades of grass or mushrooms, are liberally sprinkled throughout the game world.

Technology

The problems *Sacrifice* faces in gameplay are more than made up for in the eye candy department. *Sacrifice* is a visual feast. This game is the first we've ever seen that will actually stress a GeForce2- or Radeon-equipped PC. Luckily, it's also playable on older machines with second-generation 3D accelerators such as Voodoo.

To make a game that stresses the most powerful of systems yet still runs on older boxes, Shiny used dynamic level of detail for models and landscapes. The first time you run the game, it tests the basic abilities of your system and sets the graphics options to balance speed and visual quality. As you play *Sacrifice*, the game monitors performance, adjusting detail on the fly to keep you playing at a steady frame rate.

Sacrifice does this by tessellating the player models and the landscape on the fly. Tessellation means many smaller polygons in a model (or the landscape) are combined into fewer but larger polygons, resulting in less complex models—and fewer CPU-taxing vertices—onscreen at any given time.

Hardcore strategy gamers and visual junkies will eat up *Sacrifice*, but it may be a bit too complex for the more casual crowd.

—Will Smith

PLUSES
- Beautiful graphics
- Branching storyline
- Gorefest
- Excellent 3D audio
- Dynamic level of detail

MINUSES
- Uninspiring story
- Difficult controls
- Steep learning curve
- Units too similar
- Balance issues in multiplayer

THE SPECS

3D SUPPORT
Direct3D

NETWORK SUPPORT
TCP/IP

TOTAL PLAYERS
1 to 4

SACRIFICE

TECHNOLOGY	10
GAMEPLAY	7

$45 | Interplay
www.sacrifice.net | 800.468.3775

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Oni

WHO SAYS A GIRL CAN'T KICK ASS?

We'd heard very little about *Oni*, the third-person action/adventure game from Bungie, and, in this case, no news was good news. We were taken by surprise—in a *good* way— by this early contender for Game of the Year.

***Oni* offers bone-crunching hand-to-hand combat in the same vein as anime classics *Ghost in the Shell*, *Akira*, and *Bubble Gum Crisis*.**

PLUSES
- Fisticuff fighting is major fun
- Wide array of fighting moves
- Immersive story
- Lifelike animation

MINUSES
- No save-at-will ability
- Bland environment textures

THE SPECS

3D CARD SUPPORT
Direct3D

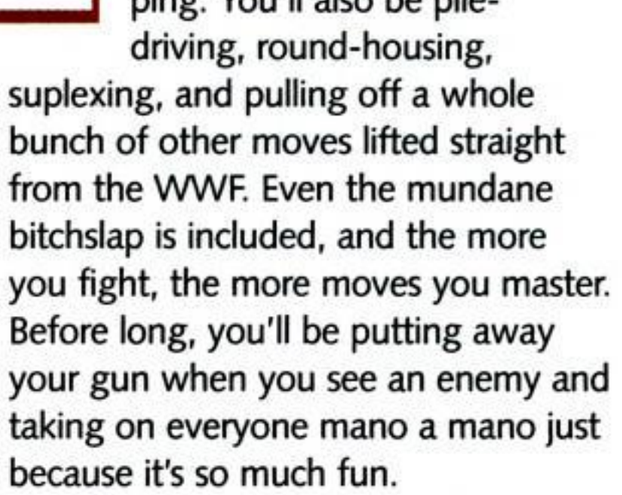
3D AUDIO SUPPORT
DirectSound

MULTIPLAYER
None

Gameplay

Oni isn't the first third-person action game to come down the pike this year, but it's the first game in a long time to emphasize hand-to-hand melee combat over weapon-based fighting. Of course, flinty-eyed shooter fanatics (like most of our staff) may bristle at the thought of not having a rocket launcher to gun down opponents, but answer this question: Which is more fun, (a) shooting an unwitting opponent dead from 20 feet away, or (b) jumping over him while catching his neck between your ankles and slamming him onto the ground as you snap his spine like a twig? The correct answer is (b), and in *Oni* you'll get to do a lot of spine-snapping. You'll also be pile-driving, round-housing, suplexing, and pulling off a whole bunch of other moves lifted straight from the WWF. Even the mundane bitchslap is included, and the more you fight, the more moves you master. Before long, you'll be putting away your gun when you see an enemy and taking on everyone mano a mano just because it's so much fun.

This game isn't a *Tekken* rip-off; it's an elaborate, story-driven adventure that's truly awe-inspiring in scope and design. You play as Konoko, a female agent of the Tech Crimes Task Force, whose job is to infiltrate and ultimately destroy an "evil crime syndicate" (are crime syndicates ever *not* evil?). Along the way you must fight, shoot, sneak, and even practice a few acrobatics to accomplish your objectives, which usually consist of locating a console that opens a door somewhere. Although trying to open doors repeatedly may sound like a throwback to action games of yore, it never gets old in *Oni*, mainly because the action is almost nonstop. Another twist is that you are unable to save your game. Instead, the game autosaves at predetermined intervals, which is frustrating, yet forces you to rely on skill to advance.



Architects designed most of the structures in *Oni*, and it shows in their stunning size and real-world look and feel.

Technology

The Bungie-designed engine that powers this game is simply incredible and, in our opinion, reminiscent of an early rev of the *Halo* engine. Although *Oni* isn't as pretty to look at as games based on the *Quake III* engine, the lack of visual grandeur is made up for with levels that are absolutely gigantic and incredibly realistic. Bungie brought in actual architects to construct the game's levels, and it shows in the sense of palpable realism that each gargantuan level displays. While textures are rendered in 32-bit color, they are consistently drab and low-detail. Thankfully, the lack of detail is offset by the intricate player models and lifelike animation. Alpha blending is the most obvious effect used throughout the game—it makes for killer explosions, weapon fire, and lighting effects.

Enemy AI is also sublimely lifelike. Opponents react to your presence, evade your maneuvers during fisticuffs, and even run for cover or make a break for the alarm when you approach, à la *Deus Ex*. Ammo is extremely scarce, however, so you're forced to rely on hand-to-hand combat for the majority of the game.

Oni is the sleeper hit of the year. If the gripping story doesn't suck you in, pile-driving a baddie's head into the ground with your thighs surely will.

—Josh Norem

ONI

TECHNOLOGY	9
GAMEPLAY	9

Price unannounced | Bungie
www.godgames.com | 877.GODGAME

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Gunman Chronicles

HALF-LIFE IS REINCARNATED AS VISCERAL, OUTER SPACE SHOOTER

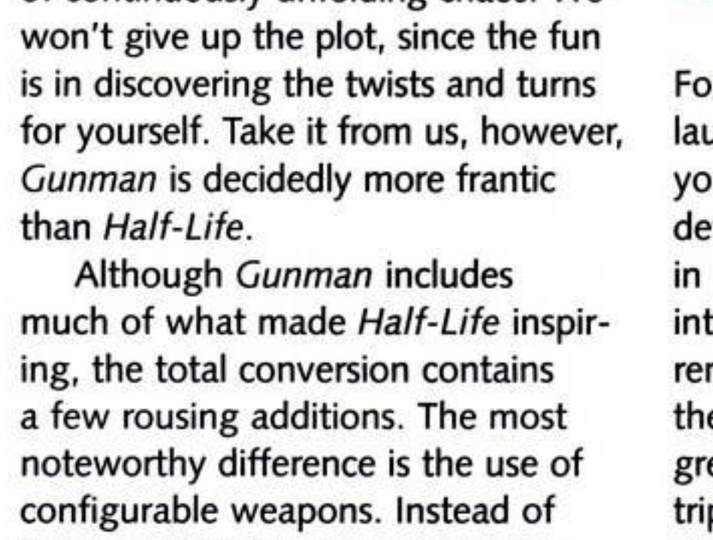
When the suits at Valve discovered a "total conversion" named *Gunman Chronicles* (*Half-Life* engine, different content), they teamed up with the creators to shine it up and release it as a stand-alone first-person shooter—no *Half-Life* executable is required. That business decision, it seems, was a smart one. *Gunman* delivers the same agonizingly intense action as the original.

The *Half-Life* engine gets a workout—and so will you—in the superb *Gunman Chronicles*.

Gameplay

Here's the story: You're part of an elite group of outer space cowboys called Gunmen, who are assigned to investigate a biological infestation on a remote planet. You show up with your team on the beautifully rendered planet and proceed to check things out. As in *Half-Life*, everything is tranquil for the first half-hour or so of gameplay—then all hell breaks loose and you're stuck in the middle of continuously unfolding chaos. We won't give up the plot, since the fun is in discovering the twists and turns for yourself. Take it from us, however, *Gunman* is decidedly more frantic than *Half-Life*.

Although *Gunman* includes much of what made *Half-Life* inspiring, the total conversion contains a few rousing additions. The most noteworthy difference is the use of configurable weapons. Instead of being outfitted with a 20-weapon arsenal, you have just a handful of weapons, but each can be customized to perform many functions.



Rather than offering the player a large arsenal of weapons, *Gunman* gives you just a handful of weapons that can be customized to perform a multitude of functions.

For example, when using a rocket launcher, you can guide the rocket yourself, make use of its homing device, have it detonate on impact or in proximity, or instruct it to explode into cluster bombs. You can even remove the rocket ammunition from the launcher and chuck it like a grenade or stick it on the wall as a trip mine. The amount of weapon customization that's required depends on the difficulty of the settings you choose, but it's a nice feature that adds a high level of control to the game.

Gameplay is linear, with minimal puzzle solving and crate smashing, which is a good thing. Our only complaint is that there are several scenarios in which we had no idea how to proceed—the clues and "environmental indicators" were simply too vague. Regardless, the game typically does a good job in guiding you along your merry way with informational signs, voice-overs, and NPCs offering advice.

Multiplayer consists of five deathmatch maps. The developers say they plan to add more game types and maps in future updates, but we don't care. *Gunman* is about the single-player experience, period.

Technology

Gunman uses the *Half-Life* engine, and according to Valve, the developers of *Gunman* haven't added any extra features to their code. The only difference we noted was the addition of "detachable body parts," meaning you can now blow creatures' heads off with a point-blank shot, which is always good for a giggle or two. Otherwise, it's the same 16-bit, *Quake*-based engine we all know and love. Not surprisingly, textures and models suffer from low-polygon counts, causing this engine to show its age compared to other titles now on store shelves. It's old-school, but at least frame rates are never a problem.

—Josh Norem

PLUSES
- Frantic gameplay
- Customizable weapons are a first
- Creative level design
- Closest thing to *Half-Life* since, er, *Half-Life*

MINUSES
- Occasional lack of direction in scenarios
- Engine appears dated

THE SPECS

3D CARD SUPPORT
Direct3D, OpenGL, software

3D AUDIO SUPPORT
EAX, A3D, DirectSound

MULTIPLAYER
TCP/IP, LAN

TOTAL PLAYERS
16

GUNMAN CHRONICLES

TECHNOLOGY	6
GAMEPLAY	9

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Plexwriter 12X/10X/32X CDR-W IDE
Black Hydraulic ATX Mid-Tower Case 300 Watt PS
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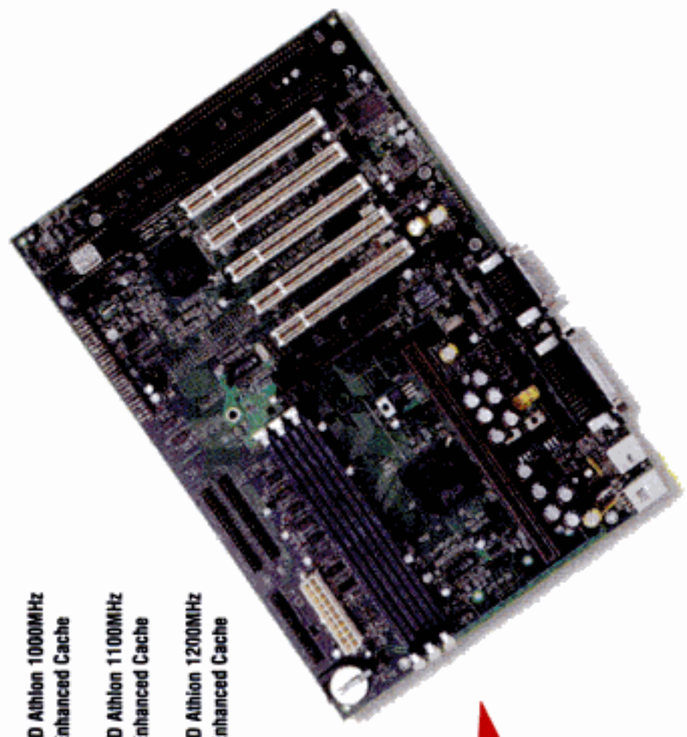

Super7™

	Part Number	Chip Set	L2 Cache (KB)	Maximum Memory (MB)	168-pin DIMM Sockets	72-pin SIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD-K6®-2/500	w/AMD-K6-2/550	w/Intel® Pentium® MMX™ 233MHz
EPoX EP-MVP3G5	MB5405	VIA Apollo MVP3	2048	384	3		Award		UltraDMA/66	5	2	1	ATX	2 Yrs.	$110	$170	$187	$160
FIC VA-503+	MB5211	VIA Apollo MVP3	1024	512	2	4	Award			3	3	1	Baby AT	1 Yr.	$79	$139	$156	$129
Shuttle HOT-591P	MB5611	VIA Apollo MVP3	512	256	2	2	Award			3	3	1	Baby AT	1 Yr.	$80	$140	$157	$130
Tyan S1590S Trinity 100AT	MB5006	VIA Apollo MVP3	1024	384	3	2	Award			4	4	1	Mini AT	3 Yrs.	$111	$171	$188	$161

Slot A

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Bus Frequency	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD Athlon™ 850MHz	w/AMD Athlon 900MHz	w/AMD Athlon 950MHz	w/AMD Athlon 1000MHz	w/AMD Athlon 1100MHz	w/AMD Athlon 1200MHz
ABIT KA7-100	MB7502	VIA Apollo KX133	2048	4	Award	200/133	UltraDMA/100	6	1	1	ATX	1 Yr.	$171	$331	$351	$371	$396	$446	$481
Asus K7V	MB7703	VIA Apollo KX133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr.	$142	$302	$322	$342	$367	$417	$452
Shuttle AI61	MB7901	AMD-750	768	3	Award	100	UltraDMA/66	5		1	MicroATX	1 Yr.	$84	$244	$264	$284	$309	$359	$394

Socket A

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Bus Frequency	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD Duron™ 700MHz	w/AMD Duron 750MHz	w/AMD Duron 800MHz	w/AMD Duron 850MHz	w/AMD Athlon™ 850MHz with Enhanced Cache	w/AMD Athlon 900MHz with Enhanced Cache	w/AMD Athlon 950MHz with Enhanced Cache	w/AMD Athlon 1000MHz with Enhanced Cache	w/AMD Athlon 1100MHz with Enhanced Cache	w/AMD Athlon 1200MHz with Enhanced Cache
ABIT KTV	MB7503	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	6	1	1	ATX	1 Yr.	$152	$224	$237	$252	$277	$312	$332	$352	$377	$427	$462
ABIT KTV-RAID	MB7504	VIA Apollo KT133	1536	3	Award	200/133	DMA/100 RAID	6	1	1	ATX	1 Yr.	$179	$251	$264	$279	$304	$339	$359	$379	$404	$454	$489
ASUS A7V	MB7704	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/100	5		1	ATX	1 Yr.	$172	$244	$257	$272	$297	$332	$352	$372	$397	$447	$482
EPoX EP-8K7A	MB7855	AMD-760	2048	4	Award	266/200	UltraDMA/100	6	1	1	ATX	2 Yr.	Call	Call	Call	Call	Call	Call	Call	Call	Call	Call	Call
EPoX EP-8KTA+	MB7852	VIA Apollo KT133	768	3	Award	200/133	UltraDMA/66	6	1	1	ATX	2 Yr	$127	$199	$212	$227	$252	$287	$307	$327	$352	$402	$437
EPoX EP-8KTA3	MB7853	VIA Apollo KT133A	2048	4	Award	266/200/133	UltraDMA/100	6	1	1	ATX	2 Yr.	$139	$211	$224	$239	$264	$299	$319	$339	$364	$414	$449
FIC AZ11	MB7402	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr.	$110	$182	$195	$210	$235	$270	$290	$310	$335	$385	$420
Microstar K7T Pro	MB7203	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr	$129	$201	$214	$229	$254	$289	$309	$329	$354	$404	$439
Tyan S2390 Trinity KT	MB7001	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	6	1	1	ATX	3 Yr.	$125	$197	$210	$225	$250	$285	$305	$325	$350	$400	$435

Slot 1

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrawed Audio	Integrawed Controller	PCI Slots	ISA Slots	AGP Slot	Formaw	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium III® 667 256K OD 133MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 850 256K OD 100MHz FSB	w/Intel Pentium III 933 256K OD 133MHz FSB	w/Intel Pentium III 1000 256K OD 133MHz FSB	w/Dual Intel Pentium III 800 256K OD 100MHz FSB	w/Dual Intel Pentium III 850 256K OD 100MHz FSB
ABIT BE6-II	MB6508	Intel 440BX	768	3	Award		UltraDMA/66	5	1	1	ATX	1 Yr.	$150	N/A	N/A	$370	$385	N/A	N/A	N/A	N/A
ABIT BX133-RAID	MB6513	Intel 440BX	768	3	Award		DMA/100 RAID	5	1	1	ATX	1 Yr.	$152	N/A	N/A	$372	$387	N/A	N/A	N/A	N/A
ASUS P3V4X	MB6723	VIA Apollo Pro 133A	1024	4	Award		UltraDMA/66	6	1	1	ATX	1 Yr.	$126	$301	$326	$346	$361	$416	$446	N/A	N/A
Intel L440GX+ (Dual)	MB6917	Intel 440GX	2048	4	Intel/Phoenix		Adaptec 2-Ch U2W	6	1		ATX	3 Yrs.	$499	N/A	N/A	$719	$734	N/A	N/A	$939	$969
Intel SE440BX-2 "Seattle"	MB6921	Intel 440BX	768	3	Intel/Phoenix			4	2	1	ATX	3 Yrs.	$115	N/A	N/A	$335	$350	N/A	N/A	N/A	N/A
Shuttle AV64	MB6309	VIA Apollo Pro 133A	768	3	Award		UltraDMA/66	5	2	1	ATX	1 Yr	$89	$264	$289	$309	$324	$379	$409	N/A	N/A
SuperMicro PIIIDR3 (Dual)	MB6157	Intel 840	4096	4	AMI	AC-97	Adaptec Ultra3/160	6		1	ATX	1 Yr.	$592	$767	$792	$812	$827	$882	$912	$1032	$1062
SuperMicro P6DGU (Dual)	MB6122	Intel 440GX	2048	4	AMI		Adaptec U2W	5	2	1	ATX	1 Yr.	$485	N/A	N/A	$705	$720	N/A	N/A	$925	$955
SuperMicro P6SBA	MB6120	Intel 440BX	768	3	AMI			4	3	1	ATX	1 Yr.	$103	N/A	N/A	$323	$338	N/A	N/A	N/A	N/A
SuperMicro P6SBU	MB6128	Intel 440BX	1024	4	AMI		Adaptec U2W	4	3	1	ATX	1 Yr.	$343	N/A	N/A	$563	$578	N/A	N/A	N/A	N/A
Tyan S1834 Tiger 133 (Dual)	MB6020	VIA Apollo Pro 133A	2048	4	Award		UltraDMA/66	6	1	1	ATX	3 Yrs.	$155	$330	$355	$375	$390	$445	$475	$595	$625

Socket 370

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video or IDE/SCSI Controller	PCI Slots	ISA Slots	AGP Slot	AMR or CNR Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Celeron™ 633 128K OD 66MHz FSB	w/Intel Celeron 733 128K OD 66MHz FSB	w/Intel Celeron 766 128K OD 66MHz FSB	w/Intel Celeron 800 128K OD 66MHz FSB	w/Intel Pentium® III 667 256K OD 133MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 866 256K OD 133MHz FSB	w/Intel Pentium III 933 256K OD 133MHz FSB	w/Intel Pentium III 1000 256K OD 133MHz FSB	w/Dual Intel Pentium III 800EB 256K OD 133MHz FSB
ABIT SE6	MB6512	Intel 815E	512	3	Award	Intel 815E	Intel 815E	6		1	1	ATX	1 Yr	$157	$249	$267	$297	$327	$332	$357	$377	$392	$447	$477	N/A
ABIT SA6R	MB6514	Intel 815E	512	4	Award	Intel 815E	Intel 815E	6		1	1	ATX	1 Yr.	$179	$271	$289	$319	$349	$354	$379	$399	$414	$469	$499	N/A
ABIT VH6	MB6511	VIA Apollo Pro 133A	768	3	Award	AC-97		5	1	1	1	ATX	1 Yr.	$110	$202	$220	$250	$280	$285	$310	$330	$345	$400	$430	N/A
ABIT VP6 (Dual)	MB6515	VIA Apollo Pro 133A	2048	4	Award		IDE RAID	5		1		ATX	1 Yr	$179	$271	$289	$319	$349	$354	$379	$399	$414	$469	$499	$619
ASUS CUBX	MB6726	Intel 440BX	1024	4	Award	AC-97		6	1	1		ATX	1 Yr.	$142	$234	$252	$282	$312	N/A	N/A	$362	N/A	N/A	N/A	N/A
ASUS CUSL2	MB6727	Intel 815E	1536	3	Award	Intel 815E	Intel 815E	5	1	1	1	ATX	1 Yr.	$166	$258	$276	$306	$336	$341	$366	$386	$401	$456	$486	N/A
ASUS CUR-DLS (Dual)	MB6728	ServerWorks LE	4096	4	Award		RAGE-XL	7				ATX	1 Yr.	$599	$691	$709	$739	$769	$774	$799	$819	$834	$889	$919	$1039
ASUS CUV4X	MB6725	VIA Apollo Pro 133A	1536	3	Award	AC-97		5	1	1	1	ATX	1 Yr.	$131	$223	$241	$271	$301	$306	$331	$351	$366	$421	$451	N/A
EPoX EP-3SPA3	MB6858	Intel 815EP	512	3	Award	AC-97	DMA/100	5		1	1	ATX	2 Yrs.	$149	$241	$259	$289	$319	$324	$349	$369	$384	$439	$469	N/A
EPoX EP-3VCA2+	MB6856	VIA Apollo Pro 133A	768	3	Award	AC-97	DMA/100	5		1	1	ATX	2 Yrs.	$109	$201	$219	$249	$279	$284	$309	$329	$344	$399	$429	N/A
EPoX EP-3VHA (DDR)	MB6857	VIA Apollo Pro 266	1536	3	Award	AC-97	DMA/100	6		1	1	ATX	2 Yrs	$149	$241	$259	$289	$319	$324	$349	$369	$384	$439	$469	N/A
Intel D815EEA "Easton"	MB6922	Intel 815E	512	3	Award	Intel 815E	Intel 815E	5		1	1	ATX	3 Yrs.	$150	$242	$260	$290	$320	$325	$350	$370	$385	$440	$470	N/A
Shuttle AV14	MB6311	VIA Apollo Pro 133A	768	3	Award			5	2	1		ATX	1 Yr	$86	$178	$196	$226	$256	$261	$286	$306	$321	$376	$406	N/A
Shuttle ME21	MB6312	Intel 815E	512	2	Award	Intel 815E	Intel 815E	3		1	1	Micro ATX	1 Yr	$109	$201	$219	$249	$279	$284	$309	$329	$344	$399	$429	N/A
SuperMicro 370SSA	MB6143	Intel 815E	512	2	AMI	Intel 815E	Intel 815E	6		1	1	ATX	1 Yr.	$153	$245	$263	$293	$323	$328	$353	$373	$388	$443	$473	N/A
SuperMicro 370DLE (Dual)	MB6154	ServerWorks LE	2048	2	AMI			6	1			ATX	1 Yr.	$342	$434	$452	$482	$512	$517	$542	$562	$577	$632	$662	$782
SuperMicro 370DL3 (Dual)	MB6155	ServerWorks LE	2048	2	AMI		Ultra160	6	1			ATX	1 Yr.	$545	$637	$655	$685	$715	$720	$745	$765	$780	$835	$865	$985
Tyan S1854 Trinity 400	MB6018	VIA Apollo Pro 133A	768	3	Award			6	1	1		ATX	3 Yrs.	$106	$198	$216	$246	$276	$281	$306	$326	$341	$396	$426	N/A

Socket 423

	Part Number	Chip Set	Maximum Memory (MB)	184-pin RIMM Sockets	Flash BIOS	Integrawed Audio	Integrawed Controller	PCI Slots	CNR Slot	AGP Slot	Formaw	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium® 4 1.3GHz 256K OD 400MHz FSB	w/Intel Pentium 4 1.4GHz 256K OD 400MHz FSB	w/Intel Pentium 4 1.5GHz 256K OD 400MHz FSB
ASUS P4T	MB6730	Intel 850	2048	4	Award		UltraDMA/100	5		1	ATX	1 Yr	$299	$809	$849	$1089
MSI 850 Pro (MS-6339)	MB6250	Intel 850	2048	4	Award	AC'97	UltraDMA/100	5	1	1	ATX	1 Yr.	$279	$789	$829	$1069
Intel D850GB	MB6923	Intel 850	2048	4	Intel/AMI		UltraDMA/100	5	1	1	ATX	3 Yr.	$269	$779	$819	$1059

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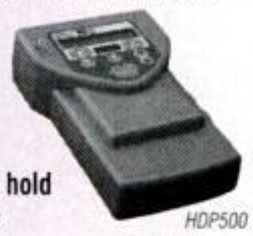

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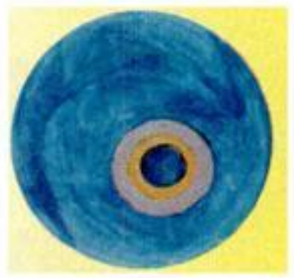

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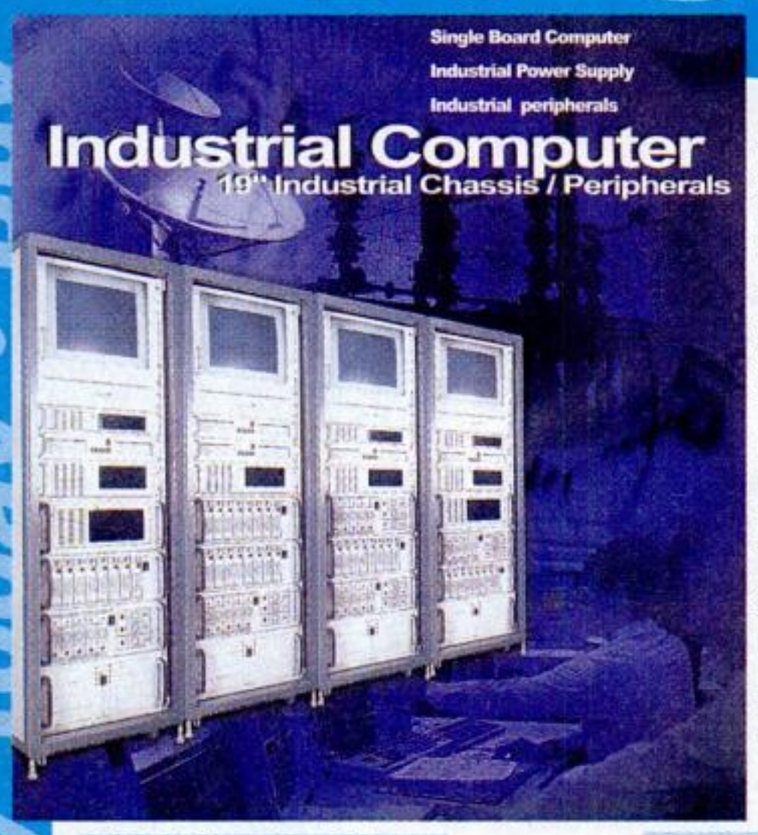

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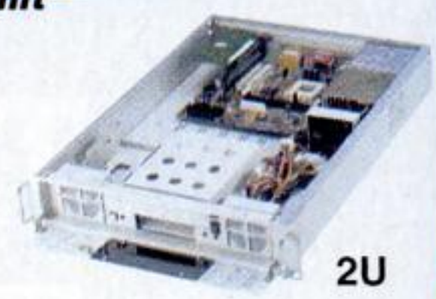

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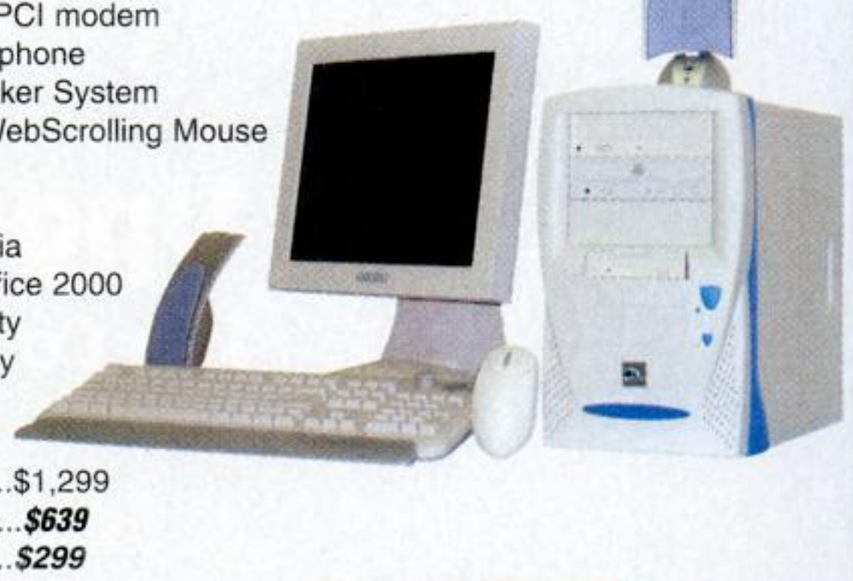

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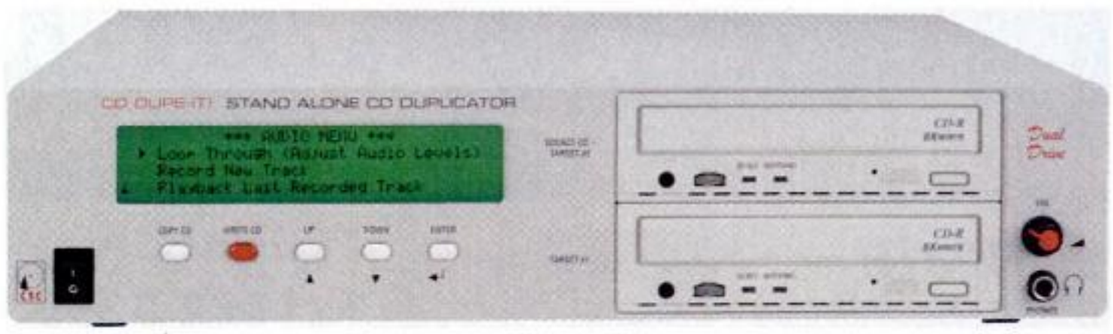
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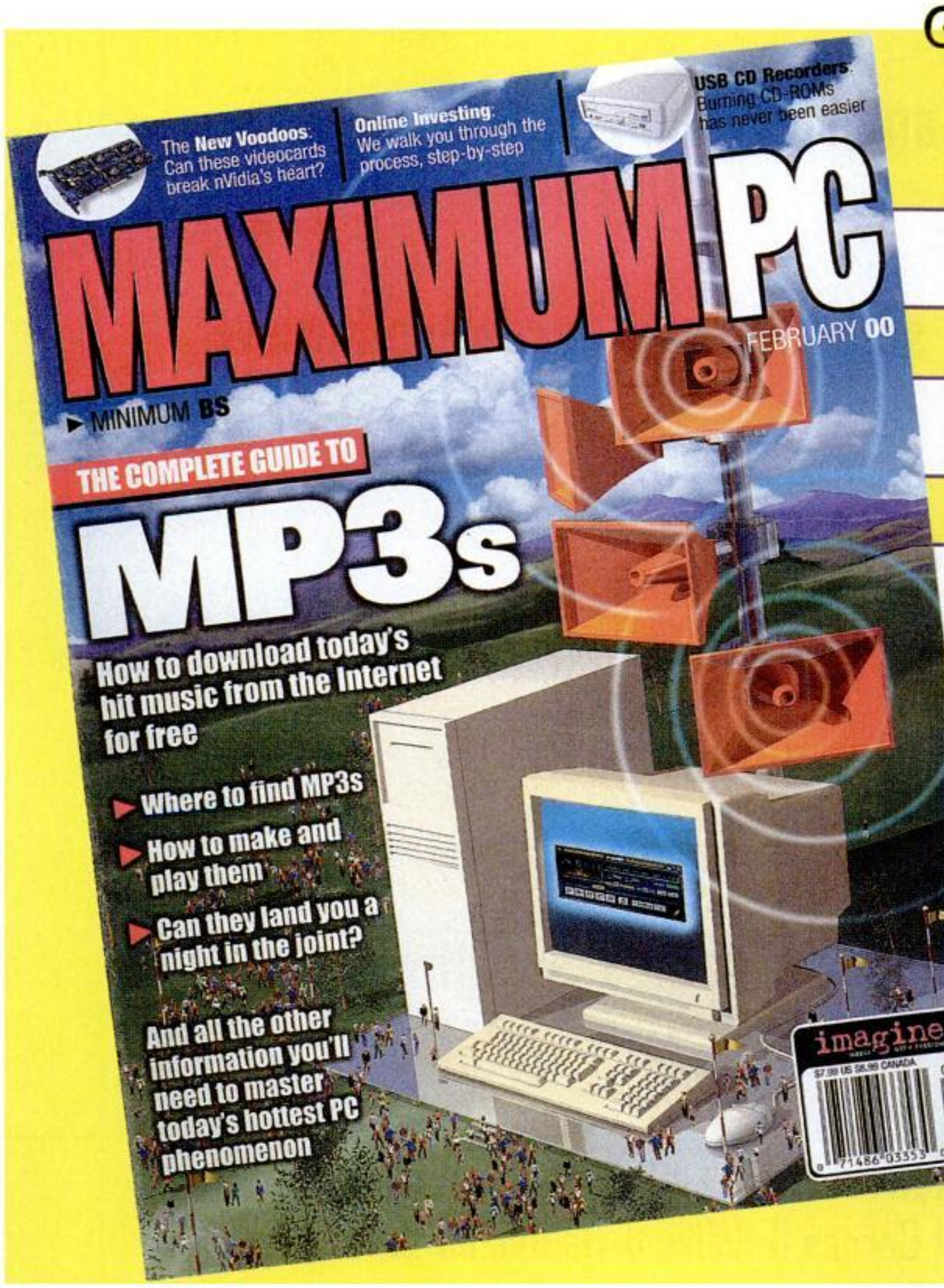
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NEXT MONTH

In the March issue of
MAXIMUM PC

Ultimate MP3 Showdown

You know how MP3s work, and you know where to find them. But we'll bet money that you're still trying to pick the perfect MP3 player among the gazillion models that are available today. We review players for your car, players for your living room, and players for your morning jog—as well as all the random little widgets that fall somewhere in between. We also name the best and worst MP3 software and take a critical look at the audio formats that are looking to bump MP3 off the map.

Super-Duper Computers!

How many processors does your computer run? One? Two? Even if it runs *four* CPUs, you still compete with the folks at Lawrence Livermore National Laboratory—their dream machine runs 8,192 processors! (And a whole bunch of memory and disk space to boot.) Next month we profile five bad-ass ultra computers, and we do our best to sneak our *Quake III* benchmark on them while no one's looking.

IDE vs SCSI

For multi-megabyte data shuffling, SCSI rules the motherboard—or does it? With the healthy proliferation of ATA/66 and the looming arrival of ATA/100, the ever-evolving IDE bus is threatening to render SCSI moot. We pit the two bus specs against each other in a contest for the ages!

Alternative OSes

Linux. BeOS. Solaris. MacOS. You'll never know what you're missing unless you try it. If you've had your fill of Windows-based operating systems, it's time to create an extra hard drive partition and experiment with an OS upstart. We profile the most powerful contenders.

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- 128MB 100MHz SDRAM
- 10GB[5] Ultra ATA Hard Drive
- 8X Max DVD-ROM Drive
- NEW 4X AGP 32MB ATI Rage Mobility™-M4 3D® Video
- Internal V.90 56K Capable[6] FaxModem
- 59WHr Li-Ion Battery ■ harman/kardon Audio
- MS® Works Suite 2001 ■ MS® Windows® Me
- 3-Yr Limited Warranty[2]
- 3-Yr Next-Business-Day On-site Service[4]
- 1 Year of DellNet™ by MSN® Internet Access[10] Included

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DELL™ DIMENSION™ L Series

Affordable Desktop Solution

- Intel® Celeron™ Processor at 700MHz
- 64MB SDRAM ■ 10GB[5] Ultra ATA Hard Drive
- 15" (13.8" vis) E551 Monitor
- Intel® 3D® AGP Graphics ■ 48X Max CD-ROM Drive
- SoundBlaster 64 V PCI LC Sound Card
- PC Speakers
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- MS® Works Suite 2001 ■ MS® Windows® Me
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]
- 1 Year of DellNet™ by MSN® Internet Access[10] Included

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DELL™ DIMENSION™ L Series

Affordable Desktop Solution

- Intel® Pentium® III Processor at 866MHz
- 64MB SDRAM ■ 10GB[5] Ultra ATA Hard Drive
- 15" (13.8" vis) E551 Monitor
- Intel® 3D® AGP Graphics ■ 48X Max CD-ROM Drive
- SoundBlaster 64 V PCI LC Sound Card
- PC Speakers
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- MS® Works Suite 2001 ■ MS® Windows® Me
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Advanced Performance, Smart Value

- Intel® Pentium® III Processor at 933MHz
- 128MB SDRAM at 133MHz
- 20GB[5] Ultra ATA-100 Hard Drive
- 17" (16.0" vis, .26dp) E770 Monitor
- 32MB NVIDIA™ TNT2 M64 4X AGP Graphics
- 12X Max DVD-ROM Drive ■ SB Live! Value Digital
- Altec Lansing® ACS-340™ Speakers with Subwoofer
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- MS® Works Suite 2001 ■ MS® Windows® Me
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]
- 1 Year of DellNet™ by MSN® Internet Access[10] Included

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DELL™ DIMENSION™ 4100 Series

Advanced Performance, Smart Value

- Intel® Pentium® III Processor at 1GHz
- 128MB SDRAM at 133MHz
- 40GB[5] Ultra ATA-100 Hard Drive (7200 RPM)
- 17" (16.0" vis) P780 FD Trinitron® Monitor
- 32MB NVIDIA™ TNT2 M64 4X AGP Graphics
- 48X Max CD-ROM Drive ■ SB Live! Value Digital
- 8X/4X/32X Max CD-RW Drive
- Harman Kardon HK-695 Surround Sound Speakers with Subwoofer
- U.S. Robotics® V.90 56K Capable[6] PCI Telephony Modem
- MS® Works Suite 2001 ■ MS® Windows® Me
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]
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- APC Pro8T2 SurgeArrest, add $39

Software:

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- HP® C315 Digital Camera, add $299

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Includes Windows Millennium Edition — the home version of the world's favorite software.

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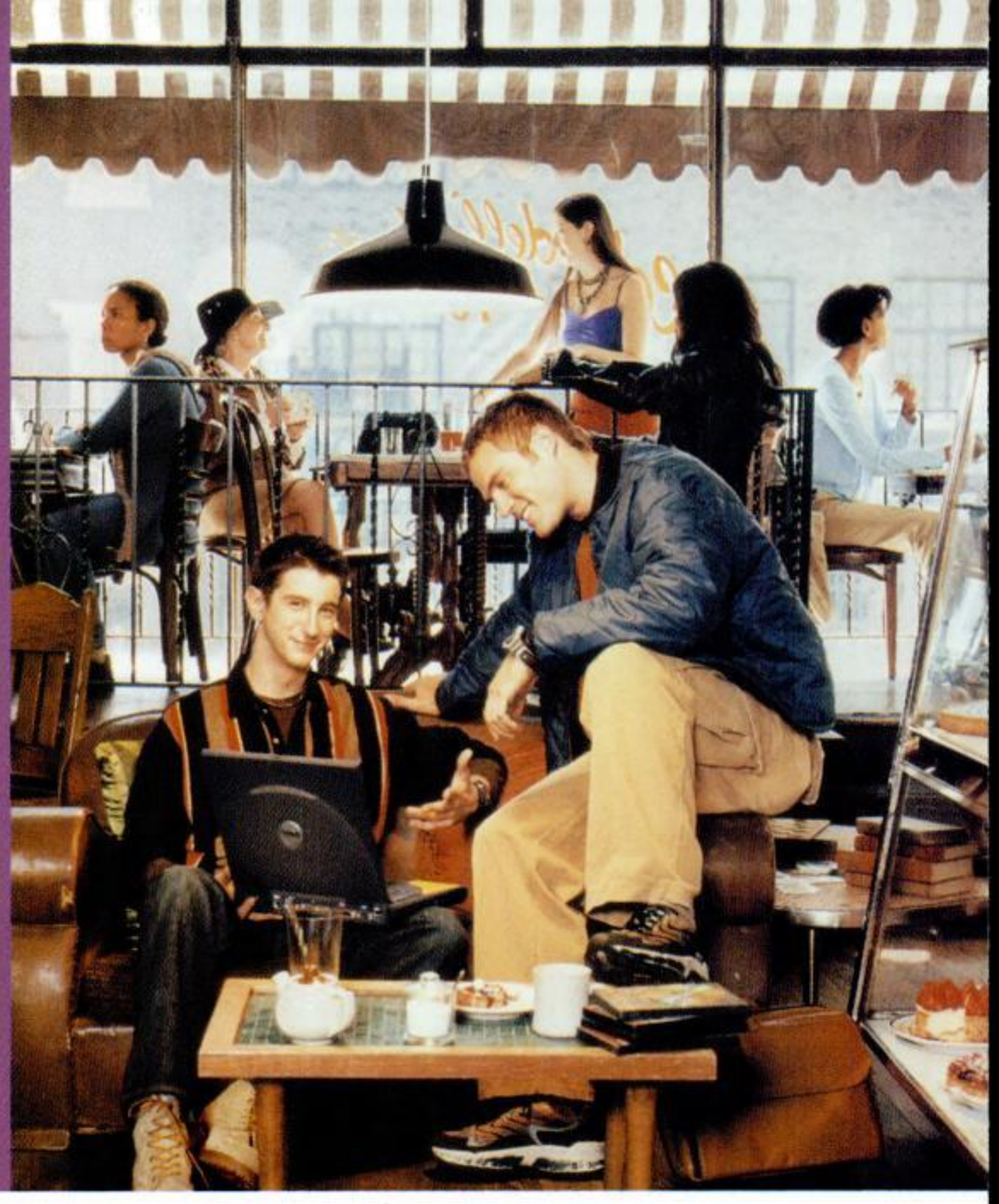

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- Internal V.90 56K Capable[6] FaxModem
- 59WHr Li-Ion Battery ■ harman/kardon Audio
- MS® Works Suite 2001 ■ MS® Windows® Me
- 3-Yr Limited Warranty[2]
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DELL™ DIMENSION™ 8100 Series

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- 40GB[5] Ultra ATA-100 Hard Drive (7200 RPM)
- 19" (18.0" vis, .26dp) M991 Monitor
- 32MB DDR NVIDIA™ TNT2 M64 4X AGP Graphics
- 48X Max CD-ROM Drive
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- V.90 56K Capable[6] PCI Telephony Modem for Windows®
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- MS® Works Suite 2001 ■ MS® Windows® Me
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]
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